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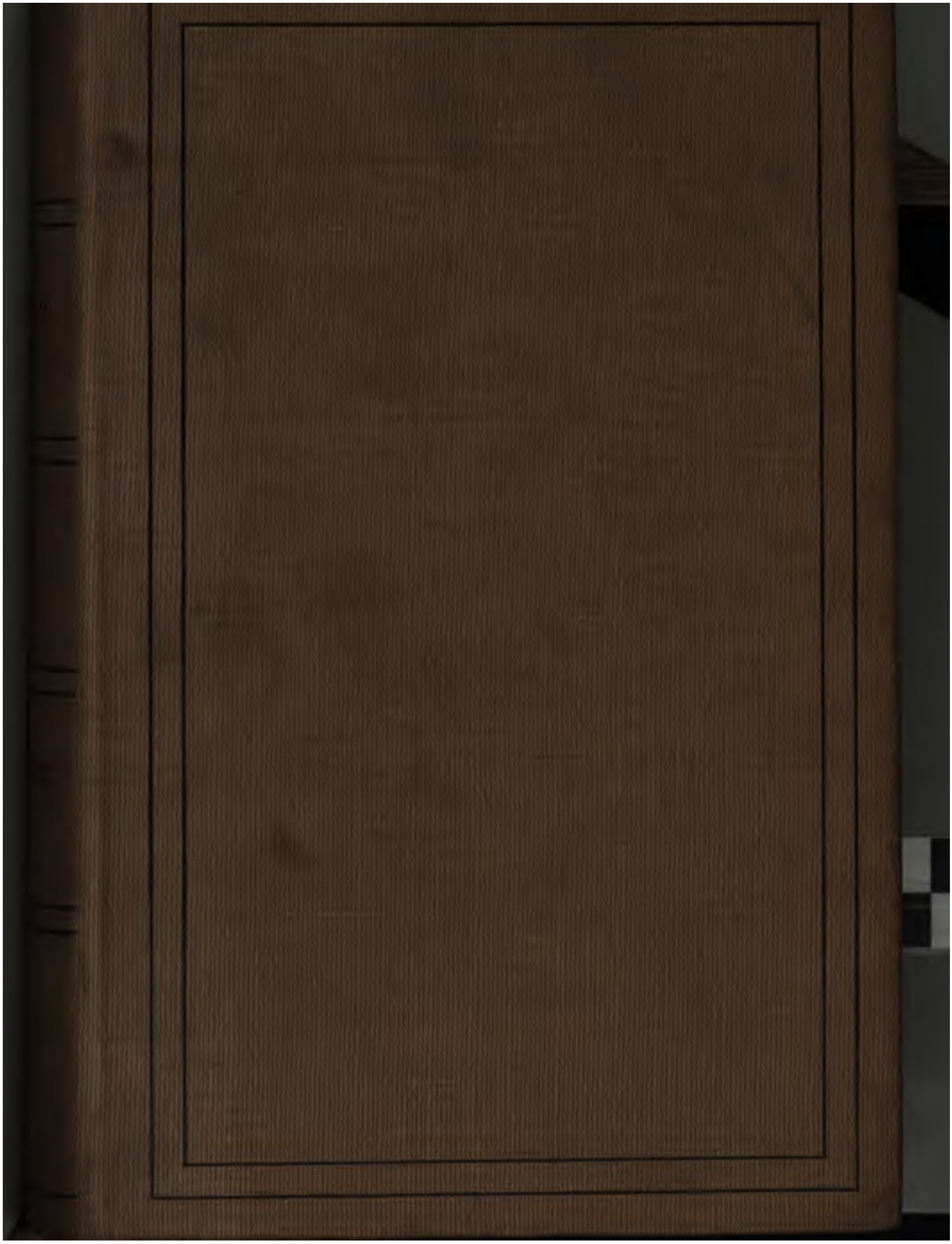

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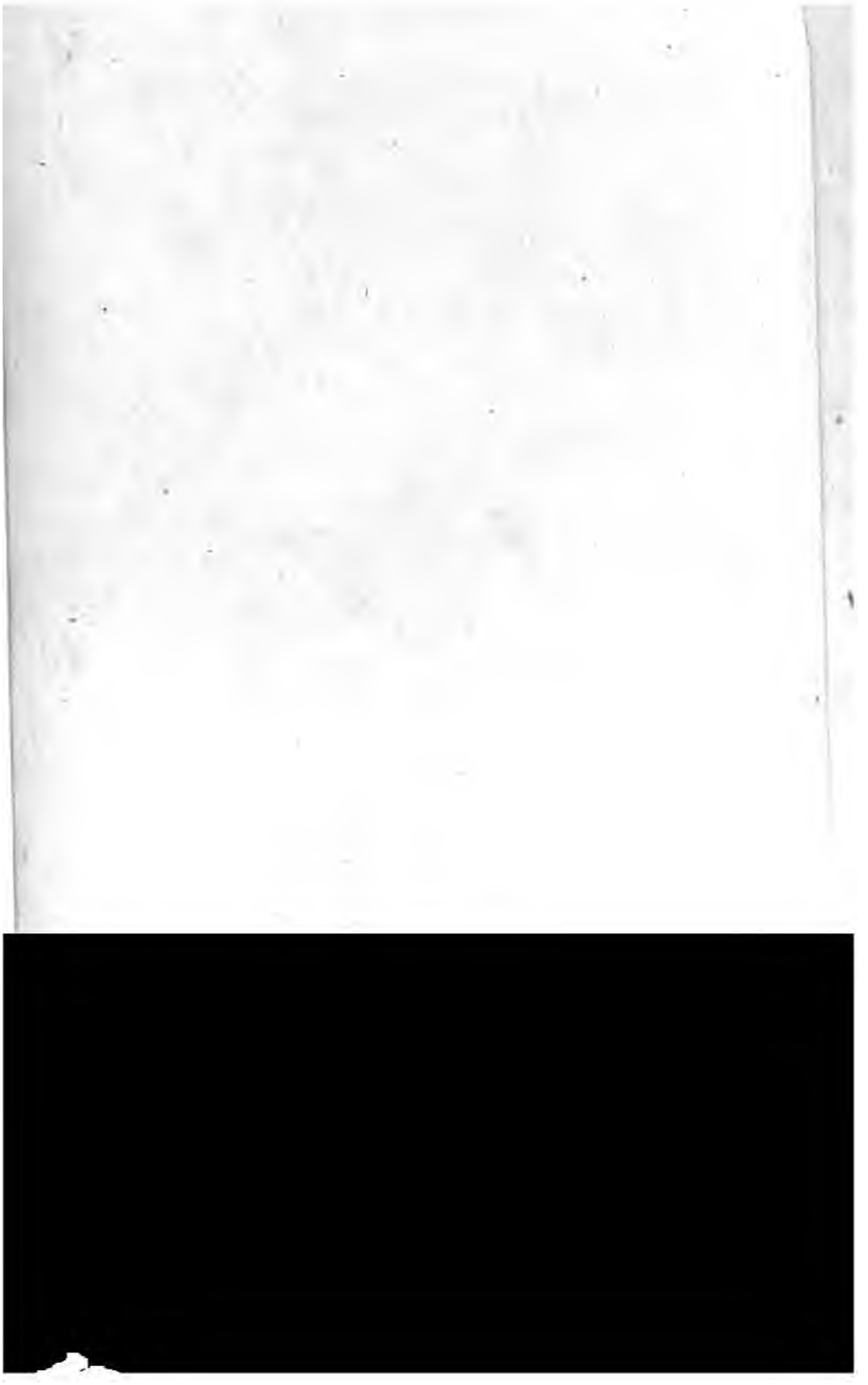
ANNUAL REPORT OF THE

ISTHMIAN CANAL COMMISSION

FOR THE FISCAL YEAR ENDED JUNE 30

1907

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907



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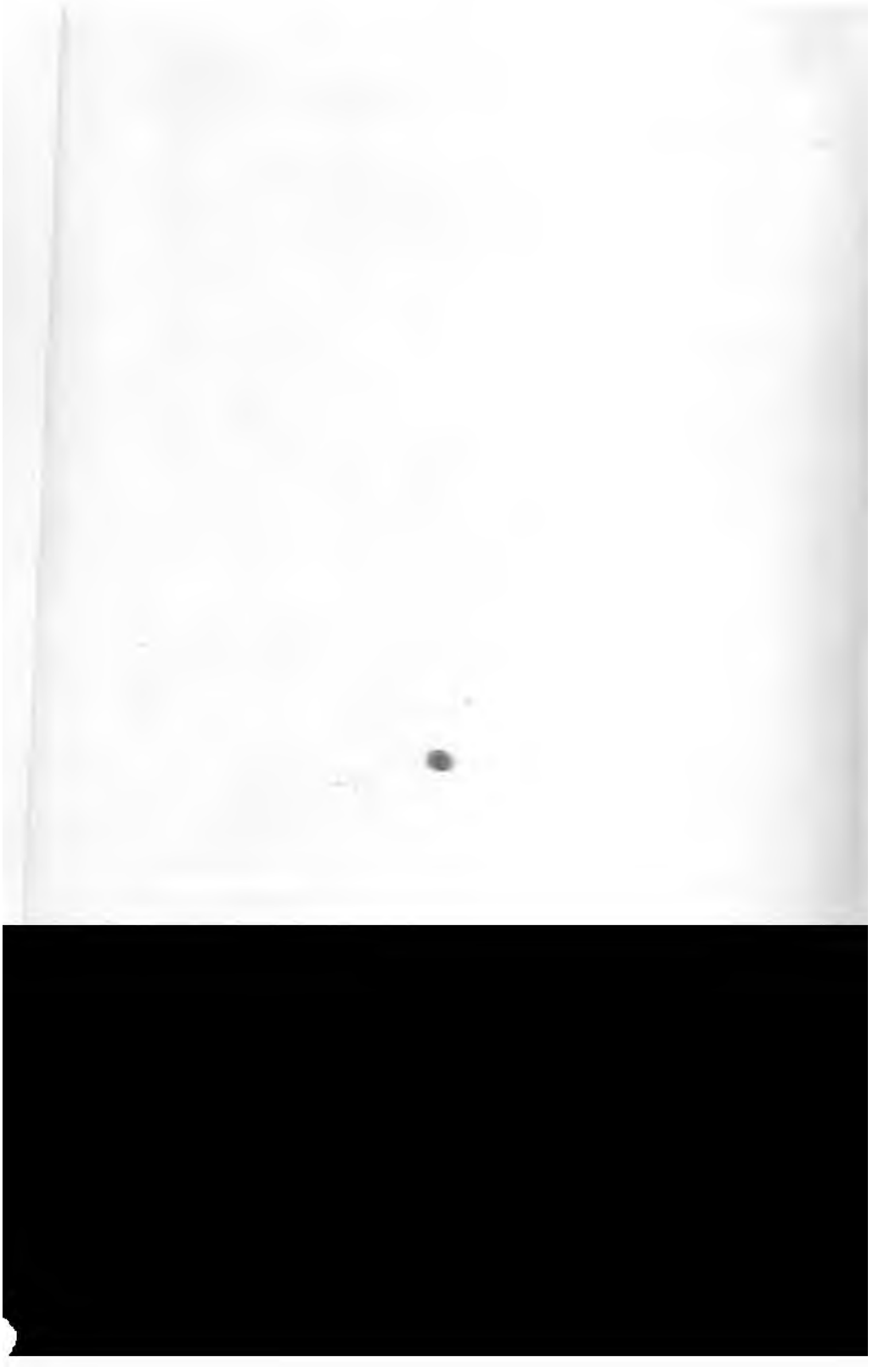

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ANNUAL REPORT

OF THE

ISTHMIAN CANAL COMMISSION.

CULEBRA, CANAL ZONE, *October 17, 1907.*

SIR: I have the honor to submit, on behalf of the Isthmian Canal Commission, its annual report for the fiscal year ending June 30, 1907.

ORGANIZATION OF THE COMMISSION.

At the close of the previous fiscal year the Commission consisted of six members. During the present fiscal year the entire personnel was changed, brought about by the transfer of Governor Charles E. Magoon, on September 25, to administer affairs in Cuba, by the acceptance of the resignations of Mr. Theo. P. Shonts, chairman, effective March 4, 1907; of Gen. Peter C. Hains, Maj. B. M. Harrod, and Rear-Admiral Mordecai T. Endicott, effective March 16, 1907, and, finally, of Mr. John F. Stevens, chairman and chief engineer, on April 1. To the vacancies thus created were assigned three officers of the Corps of Engineers, United States Army; the Chief of Bureau of Yards and Docks, United States Navy; an officer of the Medical Corps, United States Army, and two civilians. The two important changes resulted from a combination of the positions of chairman and chief engineer on March 4, and from the requirement that the Commissioners take station on the Isthmus, where they can be in direct touch with the work committed to their charge. The new Commission assumed its duties on April 1, 1907. Of the departments created by Executive order of November 17, 1906, three were then established on the Isthmus—department of construction and engineering, department of labor and quarters, and the department of sanitation. The department of law and government was under the general counsel in Washington, but was subsequently subdivided and the civil government transferred to the Isthmus.

CONSTRUCTION AND ENGINEERING.

In order to utilize the services of the engineer members of the Commission in construction work and to secure a closer supervision of the details of the work, then rapidly expanding, through a head directly responsible to the chairman and chief engineer, the department of construction and engineering was subdivided into departments, each in charge of a member of the Commission, as follows: Department of excavation and dredging, department of lock and dam construction, department of municipal engineering, motive power and machinery, and building construction.

EXCAVATION AND DREDGING.

This department of construction embraces the Culebra division, extending from the Chagres River to Pedro Miguel, the Chagres division, embraced between deep water in Lake Gatun and the Chagres River, the Colon dredging division, extending from Gatun to deep water in the Atlantic, and the La Boca dredging division, taking in all excavation between the La Boca locks and deep water of the Pacific.

Culebra division.—The last annual report of the Commission, dated December 6, 1906, states that:

> During the year the first stage of canal work, that of preparation, has virtually been passed and the Commission finds itself in position to enter upon the second stage, that of actual construction of a lock canal at an elevation of 85 feet, authorized by Congress in June last.

This statement is peculiarly applicable to the Culebra division, on which efforts had been concentrated, for, irrespective of the type of canal to be constructed, the excavation in this section of the territory had to be done. Moreover, for the time being it was the most

Better results have followed with less friction. Since the close of the fiscal year the monthly output improved over the early months of the wet season, as indicated by the following table:

Month.	Number of working days.	Daily average number of shovels at work.	Output.
1907.			*Cubic yards.*
July	26	43.38	770,570
August	27	39.70	786,866
September	24	38.50	753,468

The work of this division is dependent on mining, steam shovels, transportation, and dumps, and as these matters are described in detail in Appendix A, further reference here is unnecessary. It might be stated, however, that the greatest difficulty found in maintaining the output thus far during the rainy season is due to the dumps; the material being loose sinks under train loads after being wetted by the heavy rains, causing considerable delay if not entirely preventing the use of the dump until it has dried out.

During the year surveys were made with the view to preventing water from adjacent watersheds entering the canal. The French partially constructed a diversion channel for the Obispo River; plans have been approved for carrying this and other waters into the Chagres River about a mile above the point where the canal crosses the river, through a channel to be constructed to the east of the canal.

Chagres division.—On this division only preparatory work was done during the year, consisting of surveys and borings to determine the character and amount of earth to be removed. The Chagres River crosses the center line of the canal twenty-three times within the limits of the division. The differences of level between the river and portions of the division are such that whatever excavation in the dry is undertaken will be subject to more or less interruption from overflow during the wet season. As the rock portion of the cut can be removed or broken up by blasting more economically in the dry than in the wet, it is desirable that work be undertaken without delay; though the amount to be done is relatively not large, the conditions are such as to militate against rapid progress.

Since the close of the fiscal year work has been commenced and steam shovels diverted from Culebra division until others under contract are delivered.

Colon dredging division.—This division consists of the Mindi and Colon districts. In the former about 700,000 cubic yards of material in the vicinity of Mindi Hills will be removed by steam shovels, this method being more economical since the borings made during the fiscal year indicate that a large percentage of rock is found in this locality; the remainder will be dredged. The necessary clear-

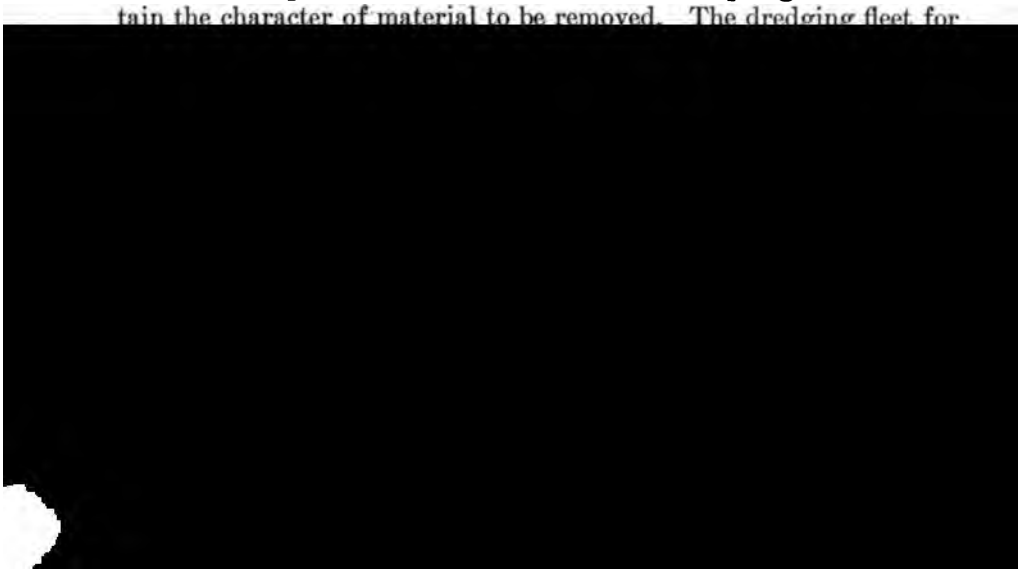
ing and other preparations were made and excavation by steam shovel was begun toward the close of the year.

In the Colon district dredging operations were in progress throughout the year, the greater part in the vicinity of the dry dock slip and along the route of the old French canal as far as Gatun. The latter was done to make a navigable waterway for the transportation of the materials that must be taken to the site for the construction of the locks. The dredging fleet consisted of one old French ladder dredge, one 5-yard dipper dredge, and one 16-inch suction dredge; and there were under contract another dipper dredge and a seagoing suction dredge similar to those now operating in New York Harbor. For use in connection with this fleet six steel hopper barges were under contract. During the year the dredges in use were served by a tug and four old French self-propelling dump barges, known as "Clapets."

The excavation by dredges during the fiscal year amounted to 1,112,321 cubic yards, place measurement, of which 43,602 cubic yards were rock; 17,000 cubic yards of the total were removed from the canal prism, the remainder of material being from accessory works.

The machine shop for the Colon dredging division at Cristobal was equipped during the fiscal year with many pieces of new machinery and is in good working order. Steps were taken to enlarge the dry dock so that when completed it will be capable of taking a vessel 298 feet long, 50 feet beam, and 15 feet draft.

La Boca dredging division.—The surveys in progress during the previous fiscal year to determine the line of the canal were continued and completed. Test borings were made in the channel west of Naos Island to a depth 40 feet below the low water of spring tide to ascertain the character of material to be removed. The dredging fleet for



For further details relating to the department of excavation and dredging, attention is invited to Appendix A.

LOCKS AND DAMS.

This department of construction embraces the Gatun locks and dam, the locks and dam at Pedro Miguel, the locks and dams at La Boca, meteorology and river hydraulics.

The locks are in pairs, each, as now proposed, with usable lengths of 1,000 feet and widths of 100 feet. The adopted project contemplates a flight of three locks at Gatun, a flight of two at La Boca, and one lift at Pedro Miguel.

Prior and subsequent to the adoption by Congress of the 85-foot level canal in June, 1906, borings were made to determine the character of the foundations at the various lock sites. The classification of the data so obtained was recorded in such a way as to cause considerable adverse comment, questioning the suitability of the material for the purpose. To actually develop the character of the foundations on which the locks are to rest five test pits each 6 feet by 8 feet were sunk to the depths of the lock walls at Gatun, two at Pedro Miguel, and one at the spillway in Gatun dam. The outcropping of trap rock at La Boca, which borings showed extends to proper depths, rendered such examinations of the foundations for these locks unnecessary. On the completion of the test pits a Board of Consulting Engineers, consisting of Alfred Noble, Frederick P. Stearns, and John R. Freeman, made a personal examination of the material, and under date of May 2, 1907, reported as follows:

> We beg to record that we found that all of the locks of the dimensions now proposed will rest upon rock of such a character that should furnish a safe and stable foundation.

Since then careful borings have been continued over the entire area in order to secure a contoured plat of the rock surface with a view to the most economical adjustment of the locks to the site.

Subsequent to the adoption of the project, studies were begun of locks, gates, and sluiceways. From these studies the Commission finally decided upon the method of filling and emptying the locks and the number and type of gates. The gates are in duplicate and of the miter type, except that the rolling gate similar to that now in use on the Ohio River will be substituted for the duplicate set at the lower end of each summit-level lock. In addition there will be provided an auxiliary pair of gates at the lower end of each flight for use as cofferdams in case it may be necessary to pump out the locks, and it has been determined tentatively to adopt a swing-bridge type of dam for emergency use. The designs for the locks and gates are progressing satisfactorily.

Gatun locks and dam.—Excavation of the lock site by steam shovels was begun in September, and by the end of March four shovels were at work, and a total of 484,362 cubic yards, place measurement, of earth and rock were removed during the year.

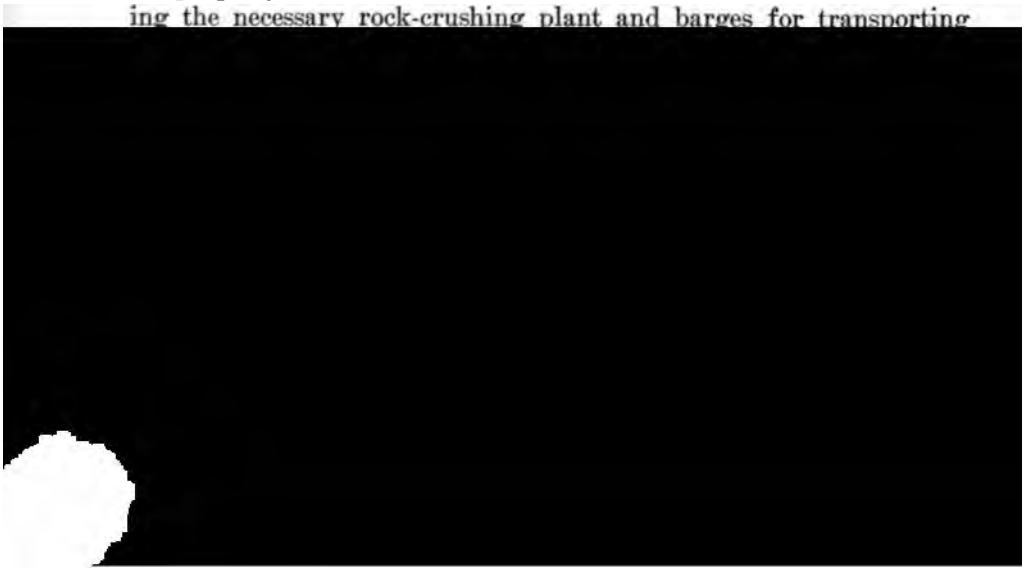
About 573 acres of the site to be occupied by the dam were cleared of timber, and a pile trestle was partially driven along the 30-foot contour on the upstream toe of the dam for the purpose of depositing rock from Bas Obispo as an integral part of the dam. Contracts were entered into for two 20-inch pipe line suction dredges for construction use on the lower portion of the dam.

The cross section of the dam has been slightly changed and the upstream slope made more gradual than that originally proposed, as will be seen by an examination of the profile which accompanies Appendix B of this report.

The report of the Board of Consulting Engineers advocating the lock canal project provides for the construction of a spillway through the dam. The work of excavation was commenced in April, and one steam shovel was placed at work; 3,832 cubic yards, place measurement, were removed and dumped in the near vicinity.

A topographical survey was made of the basin of the lake up to the 100-foot contour, and all the saddles in the hills were carefully examined to ascertain the nature of the material composing them. The survey was practically completed at the close of the fiscal year, from which the area of the lake is determined to be 164.23 square miles.

Broken stone needed for concrete construction in the locks can not be obtained in the immediate vicinity of the site and a quarry of trap rock suitable for the purpose was located at Porto Bello. Surveys of the property were made, and contracts were entered into for furnishing the necessary rock-crushing plant and barges for transporting



ments were made for the construction of a diversion channel for drawing off water which interferes with the construction of the dam so begun.

A survey was in progress for determining the area of the property that will be submerged by the lake that the construction of the two dams will create.

Meteorology.—Three meteorological stations were in operation at the end of the year—Naos Island, Ancon, and Bas Obispo—and a fourth station was begun at Cristobal.

River hydraulics.—This division of the work has for its object the collection of data necessary to predict freshets in time to take precautions for the preservation of property, and also for the determination of the amount of water that can be relied upon for supplying the lakes that will exist upon the completion of the canal.

At Alhajuela, rain-gauge and fluviograph observations were made from October 13, 1906, to the end of the fiscal year. Similar observations were made at Gamboa and Bohio during the entire year, but not until April were any gaugings of the Trinidad and Gatuncillo rivers started, when arrangements were made for discharge measurements of the several channels at Gatun.

For further details of the work of this department of construction attention is invited to Appendix B.

MUNICIPAL ENGINEERING, MOTIVE POWER AND MACHINERY, AND BUILDING CONSTRUCTION.

Division of municipal engineering.—The work performed by this division during the fiscal year included the paving of streets and construction of waterworks and sewer systems in the cities of Panama and Colon, paving, roadmaking, grading, construction of waterworks and sewer systems, and miscellaneous work of a similar nature in the Canal Zone, necessitating an expenditure of $1,741,953, divided about equally between work in the cities of Colon and Panama and work in the Canal Zone.

In general, the work has been but a continuation of the plan inaugurated at the outset of American occupation of the Isthmus—to take such steps as were necessary to make the Isthmus sanitary, so as to further the work of building the canal.

The cost of work done in the cities of Colon and Panama will be reimbursed to the United States under the terms of contracts entered into shortly after the expiration of the fiscal year, in which the United States is authorized to collect such water rates as are sufficient to reimburse itself, as above outlined. The cost of these improvements in the cities of Colon and Panama, covering work approved to date, will approximate $1,750,000.

In Panama 13,000 feet of water pipe were laid, consisting mainly of extensions in outlying districts. The waterworks system in Panama proper is practically complete. Connections were made to 2,093 houses, 1,048 meters installed, 133 hydrants, 7 water cranes, and 35 public taps placed. The average consumption of water per capita is about 20 gallons per day. The quality of water, as regards freedom from bacteria causing disease, is excellent.

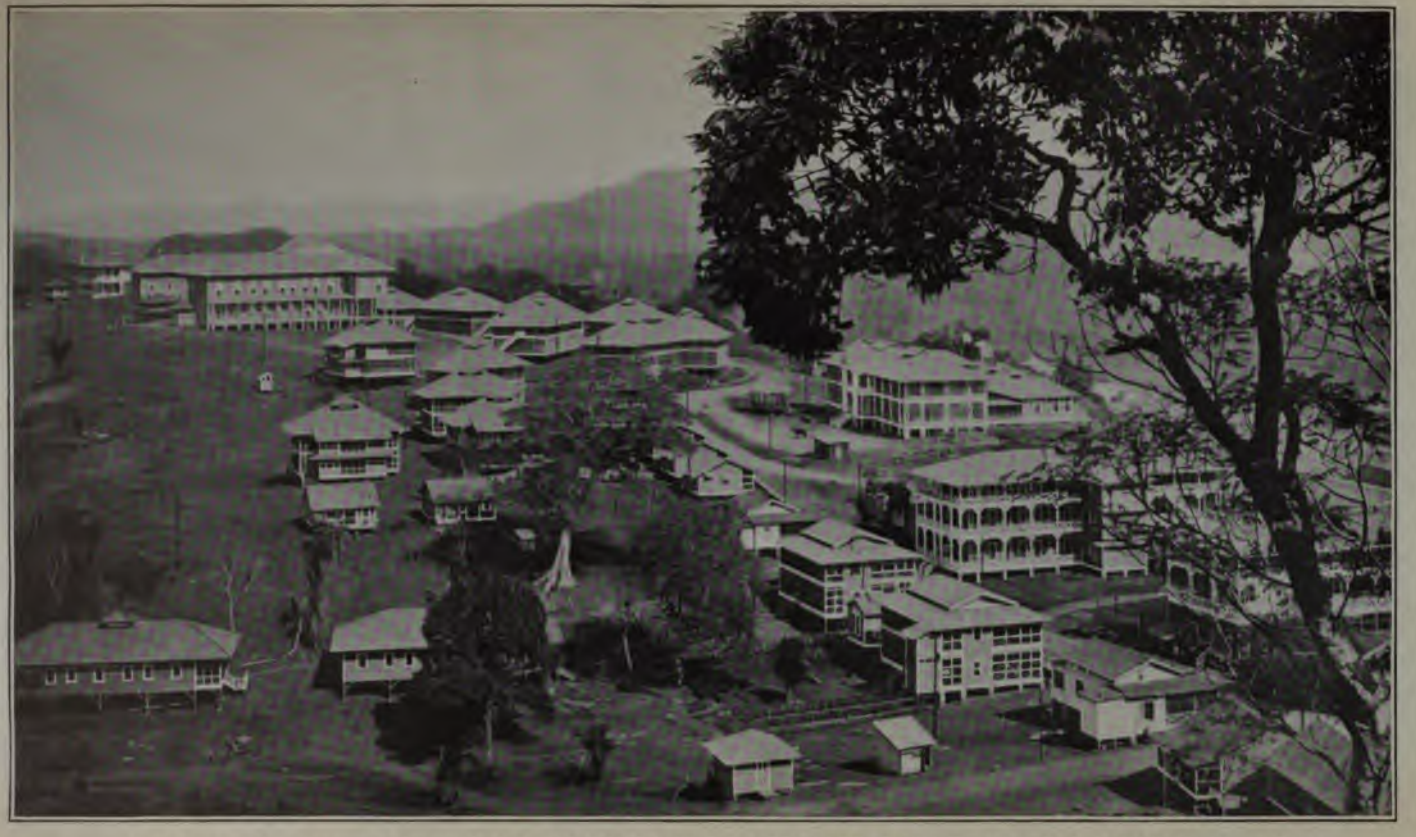
Sewer pipe to the amount of 12,232 feet was placed, 2,096 storm sewers built, 46 manholes and 62 catch-basins constructed, and two large storm-water sewers were built for special drainage purposes.

On April 3, 1907, all brick paving in the city was completed. Streets were made of sufficient width to permit the passage of two teams. This work included 21,725 cubic yards of grading, 9,056 square yards of concrete foundation, and 29,066 linear feet of curb. In the brick paving work 1,922,297 bricks were used, requiring 16,565 square yards of macadam foundation. Two thousand seven hundred and forty-six square yards of macadam paving and 19,088 square yards of concrete paving were laid.

In Colon the waterworks system is practically complete. During the fiscal year 3,956 feet of water pipe were laid, 75 house connections made, 414 service boxes installed, and 122 meters tested and set.

The sewerage system was completed, and in this work 24,521 feet of sewer pipe were used. On cross drains, 1,377 feet of sewer pipe were laid. Excavation amounting to 16,300 cubic yards was made and 62 manholes built. A sump was constructed during the year, into which all sewage flows. The completion of house connections with this system and the installation of modern plumbing was in active progress at the end of the year.

Paving in Colon included 2,500 square yards of excavation, 9,031 square yards of brick pavement, 3,211 linear feet of curb, and 2,910 feet of headers for brick pavement curb. On the streets of Colon



VIEW OF CULEBRA FROM RESERVOIR, SHOWING ADMINISTRATION BUILDING ON LEFT, HOTEL ON RIGHT, AND Y. M. C. A. CLUB HOUSE IN CENTER.

OLD FRENCH SELF-PROPELLING HOPPER BARGE, ENTERING CANAL AT CRISTOBAL.

PLATE 3.

COMACHO RESERVOIR.

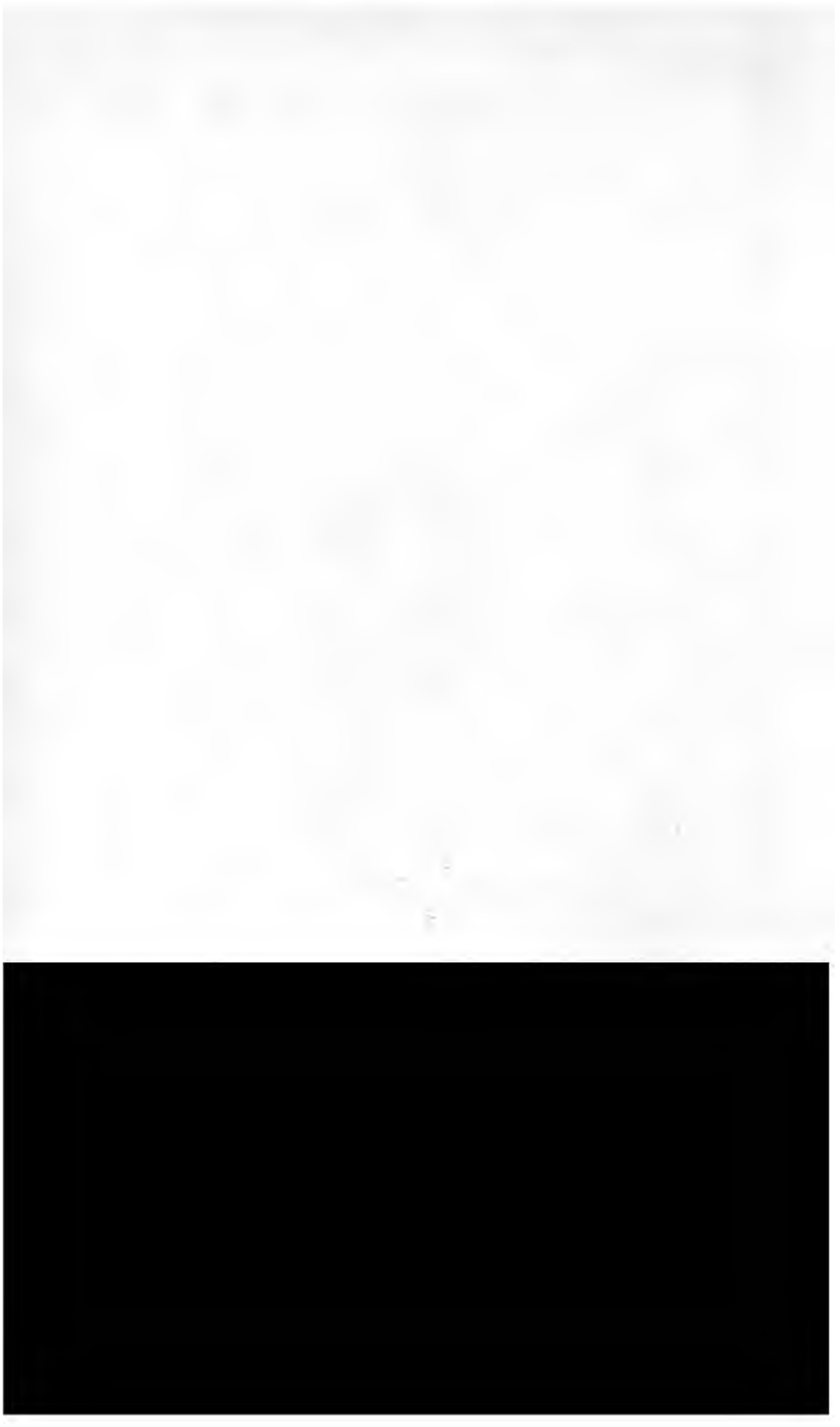


PLATE 4.

SPILLWAY AND DAM, COMACHO RESERVOIR.

four hundred and twenty-six feet of water pipe were laid, together with 1,130 feet of pipe for steam lines. Fifty-six houses were connected, 11 hydrants placed, and 34 hose valves located. Ten thousand two hundred and ninety-five feet of sewer pipe were laid, 52 houses connected, and 33 manholes built.

In La Boca 3,839 feet of water pipe were laid, 6 houses connected, and 45 hose valves placed. One hundred and eighty feet of sewer pipe were also laid, to which two house connections were made.

At Corozal 1,646 feet of water pipe were laid, 10 house connections made, and three hose valves placed. One thousand seven hundred and forty-four feet of sewer pipe were placed, 6 house connections made, and 8 manholes constructed.

At Pedro Miguel 3,118 feet of water pipe were added to the system, 35 houses were connected, and 8 hose valves placed. Four thousand eight hundred and eighteen feet of sewer pipe were laid, 33 house connections established, and 15 manholes built. About 500 feet of road grading were done.

At Paraiso a 15,000-gallon tank was installed in connection with the water system. Five thousand two hundred and six feet of water pipe were laid, 36 houses connected, 10 hydrants located, and 4 hose valves placed. Eight thousand four hundred and seventeen feet of sewer pipe were laid, 54 houses connected, and 33 manholes built.

A 16-inch Venturi meter was installed in January for measuring water consumption from Rio Grande reservoir, which has an available capacity of 248,230,000 gallons. Changes are under way which will increase the storage capacity by about 75,000,000 gallons. The stone-crusher plant, which was moved to Rio Grande from Pedro Miguel, was enlarged by the addition of two No. 5 crushers. The total output was 49,512 cubic yards.

At Culebra a pumping station, with a daily capacity of 160,000 gallons, was built, and a distilling plant was placed in operation, supplying distilled water to Culebra and Rio Grande. Five thousand nine hundred and thirty-two linear feet of water pipe were added, 103 houses connected, 18 standpipes constructed, and 12 hydrants placed. Eleven thousand five hundred and eighty-three feet of sewer pipe were laid and 91 houses connected. Six thousand three hundred and eighty-five linear feet of roads and paths were constructed.

The reservoir at Camacho, having an available capacity of 258,000,000 gallons, was completed and will be ready for use at the end of the present rainy season. In Camacho and Empire 20,702 feet of water pipe were laid, 22 standpipes constructed, 10 fire hydrants placed, and 71 houses connected. Nineteen thousand two hundred and twenty-five feet of sewer pipe were placed and 3,946 feet of macadam road constructed.

The labor supply has been ample to meet demands at all times. The average daily force carried during the year was 2,593 employees, both gold and silver.

Division of motive power and machinery.—The work of this division embraced the erection and preparation for service of machinery necessary in canal construction and its maintenance in good repair; the installation and operation of air-compressor plants; the performance of work in connection with electrical installations, and the manufacture and repair work for other divisions. During the year 2,479 employees were carried on the rolls and expenditures made to the amount of $6,360,496.56.

To date the following machinery has been erected and made ready for service: Sixty-three steam shovels, 284 locomotives, 2,706 dump cars, 18 unloaders, 13 bank spreaders, 33 unloading plows, 3 track shifters, and 7 pile drivers.

This work has been done largely at the old plants at Cristobal, Gorgona, Empire, and Paraiso. Work was commenced on new plants at Empire and Paraiso during the year, in order to provide for increased demands made on this division. In addition, limited facilities for handling equipment and making running repairs are being provided at Pedro Miguel, Rio Grande, and Tabernilla.

Engine houses for taking care of engines during the night and making running repairs were provided at Lirio, Cucuracha, Las Cascadas, and Rio Grande.

Coal chutes for delivering coal to locomotives, and which also have appliances for drying and delivering sand to locomotives, are located at Las Cascadas and Pedro Miguel.

Air compressor plants were located at Rio Grande and Empire, furnishing compressed air to operate rock drills, stone crushers, etc. Nine and one-half miles of 10-inch pipe-line mains, with 6-inch and 4-inch leads running into the canal prism, were laid, extending from Bas Obispo to Pedro Miguel. These plants also supply compressed air for operating coal chutes at Pedro Miguel and Las Cascadas, as well as such compressed air as is needed at the Empire and Paraiso shops.

A thorough boiler-inspection service was established, covering all boilers on the Isthmus, including the Panama Railroad. The jurisdiction of the mechanical engineer, master car builder, and electrical engineer has been extended to cover the Panama Railroad.

The principal work of the electrical subdivision was the construction of electric-lighting plants at Empire and Gorgona. The plant at Empire has a capacity of approximately 4,000 16-candlepower lights. About 10 miles of pole line were constructed in connection with this plant, which now supplies light to practically all build-

ings at Culebra, Empire, Rio Grande, Enterprise, Cerro, and Lirio, and extensions to Las Cascadas and Paraiso are now under way.

The Gorgona plant was placed in operation in May and has a capacity of about 2,000 16-candlepower lights. Three miles of pole line were connected with this plant, and light is furnished from it to buildings at Gorgona and Matachin, including the Gorgona shops.

Considerable work of a minor character was done, including automatic fire-alarm telegraph systems, the construction of arc-lamp circuits at different points, and other miscellaneous work.

Building construction division.—The work of this division consisted in the construction of buildings for the different departments and divisions of the Commission.

For the accommodation of gold employees 656 quarters, both bachelor and family, were constructed, and for silver employees 335 buildings were erected, consisting of barracks, bath houses, cook sheds, family quarters, and kitchens. For the sanitary department 33 buildings were constructed for hospital purposes. Larger office buildings were constructed at Empire and Ancon and additional office space afforded at Cristobal and Culebra. A school building was constructed at Culebra, and other buildings for similar purposes started at Gatun, Cristobal, and Empire. Seven mess halls for the accommodation of American employees and 11 for European laborers were completed; a large hotel at Tivoli Hill was also built, together with quarters for help and baggage room. A machine and car-repair shed, machine shop, engine house, pattern shop, and other structures for the manufacture and repair of machinery, to the number of 10, were completed and extensive plants at Paraiso and Empire were commenced. Four commissaries, sanitary storehouses, and 1 corral were completed, together with coal chutes at Las Cascadas and Pedro Miguel and division office buildings at Gatun and Ancon. Four

DAM NO 2, MOUNT HOPE RESERVOIR.

construction. Fire department buildings, jails, churches, post-offices, and fumigation houses to the number of 27 were constructed along the line.

The average force employed was 3,570 men, and in the work outlined above $4,357,587.57 were spent. The largest single item of expenditures was for quarters for gold employees, amounting to $1,432,415.51. The next largest item was for construction of silver employees' quarters, amounting to $482,502.88. For the construction of buildings for hospital purposes there were expended $315,196.57 and for supervision and clerical force $193,763.73. These figures for construction work include both labor and material.

There were prepared in the architect's office 145 finished sets of drawings, consisting of 605 sheets of tracings and bills of material for most of these sets.

Further details in connection with the work of this department of construction are given in Appendix C.

DIVISION OF MATERIAL AND SUPPLIES.

The division of material and supplies, the head of which reports directly to the chief engineer, is charged with the purchase and the proper handling of all material and equipment needed in connection with the construction of the canal. The diversity of the work necessitates the purchase and use of a very great variety of equipment, material, and supplies, including stock for repairs. All departments on the Isthmus rely upon this division to supply their various wants, and every effort is made to anticipate requirements by frequent purchases in the United States, based on estimates submitted by the different divisions or gauged by the rate of consumption of stock on hand at the various storehouses along the line.

During the year material was received by purchase to the value of $9,500,000, of which over 90 per cent covers purchases made in the United States. This has entailed the handling of 37 full cargoes of material and partial cargoes from about 150 vessels. Among other items there were 23,000,000 feet of lumber, 254,000 cross-ties, 4,000 piles, and about 50,000 tons of miscellaneous cargo. All material, except lumber, piling, ties, rail, and rolling stock, is received and checked at the Mount Hope storehouse, from which distribution is made to the several storehouses along the line. A large amount of old French material, consisting of boilers, pumps, Decauville track, cars, locomotives, cranes, and other material, has been repaired and placed in service. About 11,000 tons of this old French material were disposed of to dealers in the United States as scrap iron, and 4,000 tons of it were used as ballast by Panama Railroad vessels going north, when there was a shortage of commercial cargo.

Storehouses for the distribution of this material are located at Mount Hope (general storehouse), the dry dock, Cristobal, Gorgona,

Bas Obispo, Empire, Culebra, Paraiso, Ancon, and La Boca. Larger and more commodious storehouses are under construction at Empire and Paraiso. All storehouses carry as full a line of supplies as is carried at the general storehouse.

On April 1 damage by fire was caused to the general storehouse at Mount Hope to the extent of $100,000. This occasioned no delay in the work. The building has been rebuilt in three sections, with fire walls extending from the ground to the roof, thus minimizing the possibility of loss by fire in the future.

In addition to the work of handling all supplies for the Commission this division is charged with the care and operation of corrals and equipment used in land transportation on the Isthmus. Corrals are located at Cristobal, Gatun, Tabernilla, Gorgona, Bas Obispo, Las Cascadas, Empire, Culebra, Paraiso, Corozal, Ancon, and La Boca. Over 600 horses and mules, with the necessary wagons, carts, carriages, and ambulances, are in this service. In this connection it is interesting to note that the cost per month per team to the Commission for teams actually working, including all charges for labor, forage, and miscellaneous items, as well as expense of sick teams, was about $110. A proposal was received recently by the Commission from a contractor in the United States, who has had considerable experience in similar work in Central America, to do all land transportation at the rate of $450 per month per team, or over four times what it is costing the Commission at the present time.

A printing plant, which handles all the stationery and printing required by the various departments on the Isthmus, is also operated by this division.

The organization of this division was changed early in the fiscal year in such a way as to secure the greatest efficiency of force with the

PLATE 7.

ANCON.

The main line at Gatun now passes over a portion of the site that must be occupied by the dam, and in order not to delay work on this structure it became necessary to commence so much of the new line around Gatun as would enable the abandonment of the existing line and permit construction of the dam upon this portion of the site. With this in view operations were begun in the vicinity of Mindi and at Gatun on the new location in May. It was also considered advisable to open up from the present main line diversion tracks to the fills that have to be made so as to utilize material removed from the Culebra and Chagres divisions.

By June 30 branches from the main line had been started at Pedro Miguel, Gatun, Lion Hill, Gamboa, Miraflores, San Pablo, and La Boca Junction. A trestle 500 feet in length was driven at Gatun and a dumping trestle was being driven at Pedro Miguel. Three permanent culverts were begun at Pedro Miguel and one at Mindi.

In the construction work on the new line a total of 36,661 cubic yards of material was excavated and, including material from Culebra cut, 92,180 cubic yards were hauled and placed in embankment, permitting the laying of 6,852 linear feet of permanent track. In doing this work four steam shovels and one pile driver and an average of 1,100 laborers were engaged.

SURVEYS.

Geological survey.—A geological examination of the section of the Isthmus to be traversed by the canal was made during the year. The survey was undertaken for practical purposes, the object being to secure information in regard to the character of the sites for the locks and dams, to the classification of material to be excavated, and to determine the resources of the country in regard to building material. Much interesting and valuable data were obtained, that of most import being the availability and suitability of materials for the manufacture of Portland cement on the Isthmus in the vicinity of Gatun. The materials were combined and made into a cement which tests show to be the equal of the best grades manufactured in the United States.

Detailed information on this subject of cement, as well as on the formations to be encountered in the construction and excavation of various parts of the canal, is given in Appendix E.

Canal Zone boundaries.—The center line of the canal being practically determined, surveys were made to fix the Zone boundary lines, which, under the treaty, are 5 miles on either side of the center line of the canal. Associated with the Commission in this work was an engineer representing the interests of the Republic of Panama.

The boundary lines are marked by monuments of 4-inch wrought-iron pipe, about 4 feet long, with a brass cap suitably marked. The

monuments are set at all points of intersection of tangent lines, and other points where the lines cross streams, roads, and on prominent hills.

Miscellaneous.—Arrangements were made to project a map of the Isthmus, using therefor data of all surveys so far made, showing the watersheds of the canal.

An amount of detail work has been done in preparation of plats showing properties belonging to the Commission and lands claimed by private parties, as well as in lithographic reproduction of maps needed by the various departments.

CONTRACT VERSUS HIRED LABOR.

Under date of October 9, 1906, sealed proposals were invited for the complete construction of the canal in accordance with the approved plans, bids to be opened on January 12, 1907. As none of the bids received appeared to be entirely satisfactory, they were rejected, and the work was continued in the same manner as it was progressing at the time that the invitation was issued.

There is no question that in the majority of cases in the United States work is contracted because it can be done cheaper by that method than any other. This is generally due to the fact that the contractor has on hand a construction plant which can be more cheaply hired than purchased anew. Where, in any particular case, either from the nature of the work or its location, the contractor must purchase machinery and appliances which, so far as he can foresee, will be practically useless on the completion of the work, or where the party having the work done can make use of the plant subsequent to its completion, the advantages of the contract system disappear.

cessfully completing work are the State, War, and Navy Department building and the Congressional Library, Washington, D. C.

Omitting profits derived from subsistence and general stores, and assuming the hours of labor the same in both cases, it stands to reason that the Government, when warranted in making the necessary outlay for plant, can do work cheaper than a contractor, for no question of profits enters into consideration.

The question of Government work versus contract in connection with the Panama Canal has been discussed, and a conclusion reached in favor of the latter method because of certain stated advantages that are claimed to result. To those familiar with river and harbor improvements, erection of public buildings, light-houses, etc., and with contracts under the Government, the advantages set forth are not so apparent or real.

It is claimed that contractors have under their control and at their disposal trained labor forces, and that by a combination of such forces, through an association of contractors, team work will result, thereby accomplishing the desired end more quickly. As a matter of fact, conditions seldom enable a contractor to maintain intact his entire organization on one piece of work for transfer to another; the completion of a job means the disbanding of the force, and though new work may bring to him some of his old men, a new organization must in each case be perfected.

The Panama Canal presents a piece of work unprecedented in magnitude, which must be done under conditions entirely different from similar classes of work in the United States. The work naturally divides itself into dredging, dry excavation, the construction of the locks and dams, and the construction of the new Panama Railroad. There is no contractor or syndicate of contractors that by any combination could bring to the Isthmus an organization ready for team work on any of these units. While it is possible for several contractors to combine forces, assuming that a sufficient number of men can be gotten together in that way, there still remains the necessity for whipping this force into shape in order to secure an organization that will produce the team work so advantageous in the accomplishment of results.

From the United States the supply of labor is the same whether the work be done by contract or by the Government, and the character of the labor must be the same. So long as work is plentiful the dread of the Tropics will deter men from seeking work here in preference, and this is equally applicable to the contractor and the Government. An adequate supply of labor from the United States is not possible, and recourse must be had to securing it abroad. The records here show that no contractor can even attempt to recruit labor in the West

Indies, and that great opposition will develop to any recruiting by authorized agents of the Commission if the labor procured is turned over to contractors. These island governments can not be blamed for their hostility toward the latter because of their experience under the French, which left an indelible impression throughout the West Indies. A representative of the Italian Government has recommended to the authorities that Italian labor be permitted here for employment under the Commission, but he is not favorably inclined to the control of such labor being vested with a contractor.

It is true that in some cases the contractor may have an acquaintance which will enable him to secure suitable men more easily than a Government agent, and, again, he may bring to a work a greater experience, but so far as the most important parts of the Panama Canal work are concerned, this advantage is not apparent. In any case the knowledge of the specialist in the particular work that is to be done is the element that will accomplish the most satisfactory results, and, so far as dredging and lock and dam construction are concerned, the Government's experience has been, if not greater, at least as extensive as that of any contractor or association of contractors that can be secured in the United States. For these units of the work the Government's acquaintance is equally extensive, and experienced men can be drawn from the engineering force of the Government. These three classes of work form the most important parts of the Panama Canal, and in their prosecution the Government has the advantage. So far as relates to excavation in the dry by steam shovel and cars the advantage ordinarily would be with the contractors, yet the Government has secured and maintained an organization on the Isthmus that can not be surpassed by any contractor, and, it is claimed, has perfected this organization in as short a time as, under the circumstances, could have been done by any association of contractors.

contractor would be obliged to face as well as the United States. In some respects the Government is in a position to handle the situation more satisfactorily than a contractor, as was plainly shown by the trouble with the steam-shovel men in May last.

The wage scale on the Isthmus is practically adopted and a contractor would be obliged to maintain it. Under the recent decision that all questions of pay are to be left with the Commission, this body is placed on as secure a basis relative to the constant demands for an increase as any association of contractors.

Experience has shown that continuity of construction is more apt to result in cases where the Government undertakes the task than when it is turned over to contractors. This can be easily verified by an examination of the records (the number of failing contractors) to be found in the office of the Chief of Engineers. For all work done by hired labor continuity of work is merely a question of continuity of appropriations. It is true that continuity may be equally insured by turning the Panama Canal work over to contractors, if the contract is so drawn that practically all risks are assumed by the Government, but why this should be done, at a considerable increase in cost, is not apparent.

To anyone who has had experience with contracts on Government work, the claim that letting a piece of work by contract is a reasonable assurance that it will be completed in a definite time is utterly untenable. On public works, including public buildings, it may safely be said that in the majority of cases the time limit is exceeded. An examination of the contracts for material to be supplied the Isthmian Canal, so far as the time limits proposed by the contracts are concerned, will clearly show that there is no assurance of completion in a definite time of any contract, even though the contractors themselves, when fully cognizant of all the conditions surrounding the work, fix the time for the completion or delivery. It certainly can not be supposed, therefore, that in an enervating climate, like that on the Isthmus, and with labor below that in the United States in efficiency, this time-failing record for contract work would be changed.

Reasonable definiteness in cost is usually obtained by contract, when based on unit prices and when all conditions of the work are fully known in advance, yet these unit prices are as a rule higher than would be the cost to the Government should the latter possess the necessary plant. It is true that the contract which was proposed for the construction of the canal provided for the determination of time and cost by a board of engineers, but the conclusions on these points could be upset should conditions be found or met with unforeseen by that board. Experience on all works, even those based on more definite data than can be presented to contractors for the Isth-

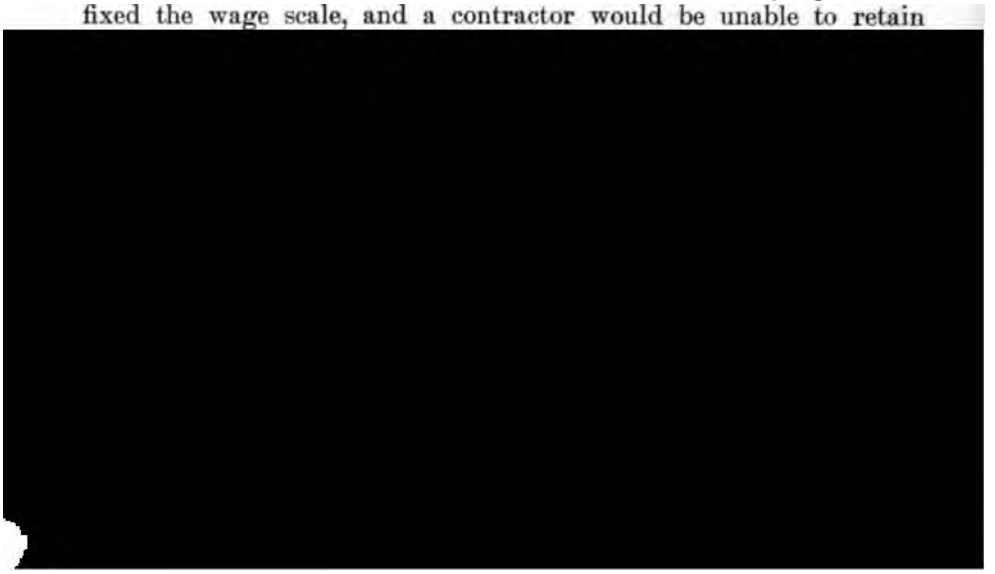
mian Canal work, shows that the unexpected is always happening, and this seems especially true of the work here.

There is no question that there are a number of people who will always believe and contend that any piece of work done by the Government could have been done as well and more cheaply if undertaken by contract, but an examination of the records will generally disprove such a contention. On the other hand, there is an equally large class who will contend to the contrary and claim, after the completion of the work, that the reverse is true.

Work heretofore has been conducted on a nonpartisan basis. The thinking class of American people fully realize the necessity for the Panama Canal and its early completion, and it is generally realized that this can be accomplished only by the application of business and nonpartisan methods. This has generally been the case with all Government work wherever undertaken, and the fact that the continuation of this policy may not continue along the same lines is hardly an argument strong enough to weigh in favor of contract work.

While it has been noted that contractors can usually do work cheaper because of plant already on hand, thereby saving the cost of new machinery, and because of greater familiarity with the class of work on which they are engaged, there are at times additional ways for securing the same results, namely, (*a*) by paying lower wages, (*b*) by working their men longer hours, (*c*) by requiring a greater amount of work per hour from the men, (*d*) by giving them less expensive rations and quarters, in case employees are fed and quartered.

On the Panama Canal a contractor can not anticipate profits from any of these sources. The work already done and in progress has fixed the wage scale, and a contractor would be unable to retain



ing on contract work. Moreover, the pace set by the laborers under the Commission would fix the rate for the contractor.

Were all the work turned over to one contractor, or an association of contractors, the Commission would be obliged to maintain a supervisory force, and the feeding and quartering of these employees would determine the demands that the contractor's men would make upon him for accommodations. Moreover, a number of the dwellings that are now occupied by Commission employees would be turned over for occupancy by contractor's men, and any additional force would expect the same accommodations. Trouble would result, therefore, in case the contractor fed his employees on less expensive rations or quartered them less comfortably than the Commission; no saving could be made, and the Government would be obliged to foot the bills.

The Panama Canal work is naturally divided into—

(1) Excavation in the dry by steam shovels, including all of the Culebra division and part of the Chagres division. The construction of drainage and diversion channels would come under this heading.

(2) Excavation by dredges on the Colon and La Boca divisions and on part of the Chagres division.

(3) The construction of the dams.

(4) The construction of the new Panama Railroad.

(5) The construction of the terminal facilities, harbor basins, and breakwaters, if any.

(6) The construction of locks, gates, and spillways.

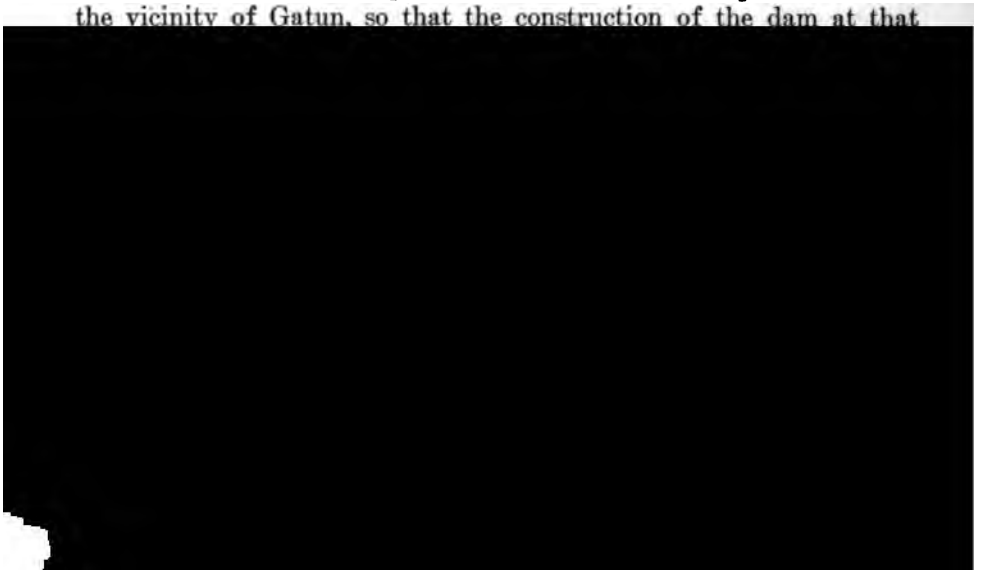
The excavation of the Culebra division has already been undertaken by hired labor; practically all of the plant required for this work has been secured and paid for; a complete and thoroughly efficient organization for the same has been built up, and the Government is not hampered in any way in procuring the necessary labor for filling vacancies that arise. In the organization that has been perfected the higher grade men were formerly employed by contracting firms, and some of the number have been successful contractors themselves. The conduct of this work, therefore, has been along the lines usually followed by contractors. Under the circumstances no advantage would accrue to the United States by letting this piece of work to contractors, but on the contrary there would be not only additional expense, but a feeling of unrest and dissatisfaction engendered among the present employees materially affecting efficiency. Under existing conditions, therefore, contract work can not be recommended for the Culebra division.

The Government has on hand, or under contract, all the dredges that will be needed for excavating such parts of the canal prism as can be most economically performed by this class of machinery. Experience in the United States has demonstrated that with such a

plant in its possession no contractor or association of contractors can do the work as economically as can the Government. The Government agents are as familiar with this class of work as the contractors, and the necessary dredge crews can be obtained without difficulty. So far, therefore, as dredging is concerned, the Government should do the work and contracts for the same can not be recommended.

The great problem in the construction of that portion of the canal included in the Culebra division is the disposal of the excavated material. In the main this has been disposed of at various localities favorably situated with regard to the cut. The systematic performance of the work and the necessity for additional material in completing other parts of the work have made it necessary to arrange for such a disposition in the future as will be most beneficial to the work in its entirety. The efficiency of the dams depends upon their having sufficient weight and tightness to impound the water without leakage and without danger to the stability of the structures. The weighty material, or rock, is to be furnished in each instance by material from the Culebra cut and the tightness is to be secured by the selection of suitable material to be obtained from the products of dredging. In other words the construction of the dams is so intimately connected, both with the excavation of the Culebra cut and the dredging, that if these two can be most economically and advantageously done by the Government rather than by contract it naturally follows that the method adopted for the construction of the dams must be the same, namely, by hired labor under Government supervision and not by contract.

The survey of relocation for the Panama Railroad has been completed and it has been necessary to undertake the construction of the railroad in order to permit the removal of the present bed in the vicinity of Gatun, so that the construction of the dam at that



same method of construction, namely, hired labor under Government supervision, in the construction of the new Panama Railroad.

The regulating works and spillways of the Gatun and La Boca dams are so dependent upon and intimately connected with the construction of the dams that whichever method is adopted for the latter must be made applicable to the regulating works and spillways, in order to avoid friction and difficulties that would result in case part were done by the Government and part by a contractor.

The Panama Railroad must be maintained and operated as a commercial line, and it must be utilized also for construction purposes in connection with the Culebra cut, the reconstruction of the railroad, the construction of the dams, and in addition it must transport all materials entering into the construction of the Pedro Miguel locks.

The difficulties that would result from a joint use of the Panama Railroad by a contractor and the Government at the Pedro Miguel locks disappear, however, for the locks at Gatun and La Boca, since both are accessible by water. Sand can be procured along the shores of the Pacific, and a suitable quality in sufficient quantity can also be obtained on the Atlantic shore of the Isthmus.

The success of the lock construction depends largely upon the quality of cement used, and there is no question that the Government should furnish all the cement. No contractor, or association of contractors, possesses the necessary plant for handling the enormous quantities of concrete required for these structures. Subsequent to the construction of the locks the contractor could have no further use for the machinery installed, even if the payment of freight for its return to the States were warranted. If the contractor furnishes the plant, the Government must pay for it in its entirety and in addition pay interest on the amount expended for its purchase. This plant can be procured more cheaply by the Government than by a contractor. As previously explained, if the Government furnishes the plant, the advantage of the contract method disappears. The contractor will have greater difficulty in securing the common labor needed than will the United States. The engineering force of the Government that has in the past few years been employed in the construction of such large quantities of concrete in various forms in the United States can be drawn upon to furnish the skilled personnel necessary for concrete work here. The acquaintance with competent men, for this class of work, is more extended on the part of the Government than on the part of the contractor.

These considerations lead to the conclusion that the locks can be more economically and advantageously constructed by the Government than by a contractor or association of contractors.

The gates and operating machinery can, it is believed, best be constructed by contract at the proper time.

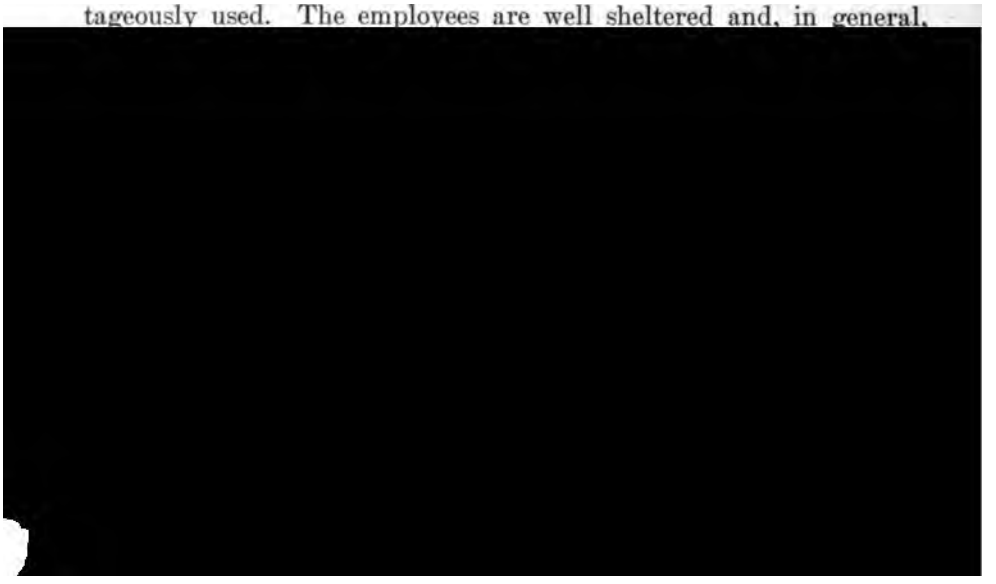
The foregoing conclusions do not cover the proposed work on the Chagres division or the terminal facilities, harbor basins, and breakwaters, as the surveys for the development of the amount of work and character of material involved in the Chagres division have not yet been completed, nor have the final plans for terminal facilities, etc., been finished.

No account has been taken of the question of sanitation, one very important to the successful prosecution and completion of work on the canal. Proper sanitation can be maintained more easily and satisfactorily with the Government in supreme control of the work than with a contractor, and this adds an additional argument in favor of the Government doing the work itself.

The relative advantages of the contract system versus hired labor under Government supervision in the construction of the Panama Canal are very different to-day from what they were two years ago, and were different then from what they were when the work was first undertaken. To one familiar with conditions on the Isthmus there can be no doubt at this stage of the work as to the advisability of continuing it by hired labor.

It is estimated that 80 per cent of the entire plant needed for the construction of the canal has been purchased or contracted for. Machine shops have been erected and equipped for making all needed repairs to the machinery now on hand or still required for the work. So far, therefore, as the plant and its care and repair are concerned, the Government is better equipped to carry on the work as advantageously and economically as any contractor.

Many thousand employees have been secured, and an effective working organization has been perfected, and the recruiting system put in operation is capable of furnishing more labor than can be advantageously used. The employees are well sheltered and, in general,



according to their standing as gauged by salary earned and in conformity with rules and regulations approved by the Commission.

It supplies furniture to quarters, delivers distilled water to residences, offices, and shops, and is in direct charge of the delivery of all food supplies, including ice, bread, and cold-storage articles from railroad stations or local commissaries to residences, hotels, messes, and kitchens.

It polices the grounds around camps and quarters, cleaning up waste and refuse material which is placed within reach of those charged with its final disposition. It also has charge of the lighting of the camps and of roads to and through them.

It operates the hotels, messes, and kitchens for the accommodation of the employees of the different grades—the hotels for white Americans, the messes for Europeans, and the kitchens for the natives of the West Indies.

It keeps the service history of each individual employee in the general personnel record of which it is the custodian; issues by order of the chairman and enters therein all orders pertaining to leaves of absence, sick leave, resignations, discharges, promotions, and reductions. It also authorizes the issuance of steamship transportation and special rates to which employees are entitled.

Labor supply.—The skilled labor force is recruited in the United States. Agents of the Commission receive applications for all outside positions, personally examining the individual and looking into his previous service record. This includes trainmen, steam-shovel operators, foremen, and mechanics. Clerks, stenographers, draftsmen, doctors, and nurses are secured through the civil service registers. The skilled force on June 30, 1906, was approximately 2,500, and on June 30, 1907, actually 4,404. To increase this force 1,904 men and provide for the usual separations, due to sickness, resignations, etc., 3,038 men were brought from the United States during the year.

The unskilled force is brought from the West Indies and Europe. Recruiting agents are located in Barbados and Martinique, and a representative in Paris, France, to keep in touch with European labor conditions and with European emigration. On June 30, 1906, there were on the canal work 500 Europeans and 13,625 West Indians. June 30, 1907, there were 4,317 Europeans and 14,606 West Indians. To maintain this force of laborers, and also provide the Panama Railroad force of about 5,000 laborers, 6,899 Europeans and 10,947 West Indians were brought to the Isthmus—an average of nearly 1,500 men per month—to meet the demands of the work for common labor during the year.

The total force of skilled and unskilled laborers of the Isthmian Canal Commission and Panama Railroad on June 30, 1906, was

19,600, and on June 30, 1907, it was 29,446—an increase in the total of 10,000 men. During this period 20,884 men were brought to the Isthmus from the United States, Europe, and the West Indies. The labor problem is still an unsolved one, but the experiments of the past year with a diversity of races and nationalities has improved the efficiency of the force and promises to make the term of service longer. Tropical labor is migratory, and notwithstanding superior wages, housing, and subsistence, there will always be large periodical changes in the individual force. A regular recruiting organization, changed from one labor center to another, will always be necessary to keep a maximum force available.

Quarters.—At the close of the last fiscal year 1,129 houses were available for quartering employees of all classes, furnishing buildings for offices, hotels, messes, kitchens, and storerooms On June 30, 1907, 2,208 buildings were in use for the same purposes. Considering the large increase in the skilled force and the number of women and children provided for during the past year, the number of people from the United States in quarters now, as compared with the close of the last fiscal year, is just about doubled, but they are all better and more comfortably housed than at this period last year. New houses are being turned over every day, and each house finished relieves the congestion, if any, in that particular locality, or enables some employee to send for his family. The congestion in the quarters of the common laborers has entirely disappeared, due to two causes, first, the completion of a great many houses during the past year, and, second, the fact that with improvement in efficiency it is not necessary to house as large a number of men as formerly.

Subsistence.—At the close of the fiscal year 15 hotels were operated for white Americans, where good wholesome meals are furnished for 30 cents each. These hotels are under the direction of stewards from

fact that insufficient nourishment impaired his usefulness as a laborer, and sooner or later landed him in the hospital.

These hotels, messes, and kitchens are inspected daily by the supervising employees of the department of labor, quarters, and subsistence, and weekly by the district physician. All meats, vegetables, and food supplies are carefully inspected before they are used.

The number of meals served during the month of June, 1907, is as follows: Hotels, 197,419; messes, 286,155; kitchens, 456,765, or nearly a million meals for the month.

The subsistence operations are merely self-sustaining, and it is not the purpose to make a profit. They are operated upon the basis of contributing messes as far as possible.

For further details of this department attention is invited to Appendix F.

ZONE GOVERNMENT.

The department of civil administration embraces the affairs of government of the Canal Zone, the courts, the office of the prosecuting attorney, and the divisions of revenues, posts, customs, lands, administration of estates, police, education, fire protection, and public works.

Governor Magoon left the Isthmus September 25, 1906, when the duties of his office devolved upon the executive secretary until November 17. The Executive order of November 17, 1906, created the department of law and government under the general counsel, after which date governmental matters were handled in Washington by the general counsel through the executive secretary on the Isthmus. On April 2, 1907, an Executive order vested the authority of the chief executive of the Zone in the chairman of the Commission, and by order of the latter the duties were assigned to one of the Commissioners.

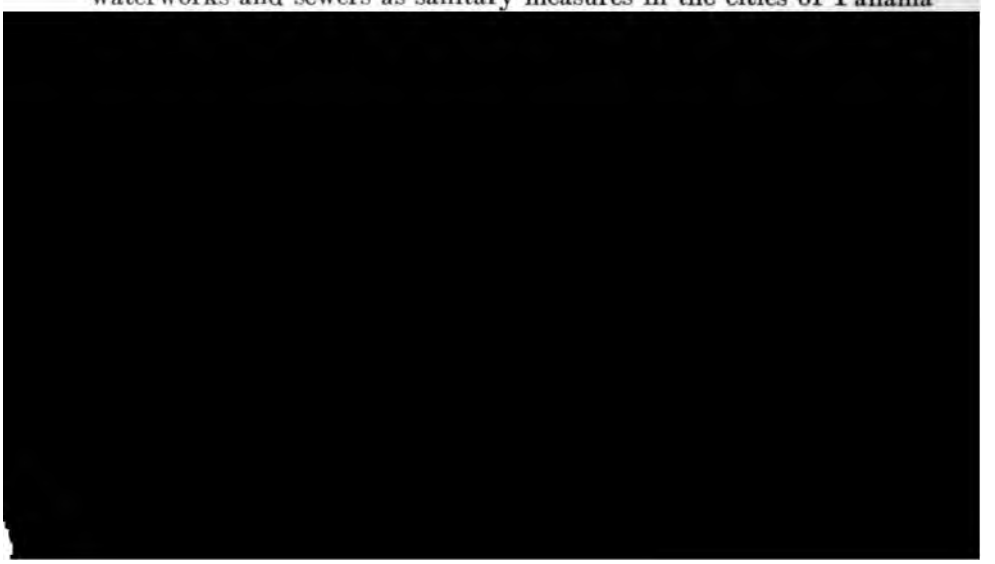
Under the authority conferred upon the President by existing law to legislate for the Zone, the five municipalities into which the Zone was divided were abolished and administrative districts were created in their stead. The United States patent, trade-mark, and copyright laws were extended to the Zone; provisions were made for regulating insurance companies, for the registration of land titles, and the celebration of marriages. The penal laws were amended, and a new code of civil procedure was put into effect.

By the order of March 13, 1907, the Commission is authorized to enact, with the approval of the Secretary of War, ordinances relating to police, sanitation, and taxation, and matters formerly regulated by municipal ordinances. By virtue of this authority the Commission enacted ordinances regulating the sale of liquor and prescribing certain taxes in the Zone.

A joint commission, consisting of B. S. Ambler and Montgomery Blair, representing the United States, and C. Arosemena and S. Lewis, the Republic of Panama, undertook to settle certain claims against the Commission, due to loss or injury to private property, and to fix the value of lands required for canal purposes. This commission was unable to agree upon the value of any of the property considered by it except the islands in Panama Bay and the improvements thereon. In the claims originating from the Malambo fire, while unable to determine the origin and cause of the fire, the commission recommended payment by the United States to the claimants of amounts aggregating $54,037.

A question was raised as to the right of the Central and South American Telegraph Company to land its cable through Manzanillo Bay under authorization by the Secretary of War, without permission of the Republic of Panama. It is claimed by the latter that the 3-mile limit, included within the Zone limits under the jurisdiction of the United States as stipulated by the treaty, is measured along the center line of the canal as finally determined, and from the point of intersection of this center line with the low-water mark of Limon Bay; further, that the Zone is bounded on the north by a line perpendicular to this center line through the point 3 miles out. With this interpretation of the treaty provisions, the Republic of Panama claims that the cable passes through waters over which Panama still exercises sovereign rights, and her permission must be obtained. It is to be noted in this connection that, under such a contention, the ends of the canal are under the control of Panama. Action against the cable company is deferred until this question of the delimitations of the Canal Zone is definitely settled.

Under the treaty the United States was authorized to construct waterworks and sewers as sanitary measures in the cities of Panama



There being some question whether there is authority for the extradition from the Canal Zone of fugitives from justice to any foreign country having an extradition treaty with the United States, it is considered advisable to extend the extradition laws and treaties of the United States to the Zone by Executive order.

Under the authority vested in the Commission to exclude and deport certain undesirable classes of persons there were 56 deportations during the fiscal year, exclusive of the deportation of persons certified to be chronically sick.

Sixteen post-offices were in operation in the Canal Zone and the amount of business handled at these offices steadily increased; 90,928 letters and parcels were registered, and the amount of money orders issued was $2,318,965.34. Money orders were largely purchased by employees on the line of the canal for the purpose of securing a safe depository for their funds, there being an entire absence of banking facilities outside of the cities of Panama and Colon. Efforts were made to advertise, by circular and otherwise, the money-order system among the European laborers in order to save them the payment of large rates of exchange.

The customs service of the Zone is confined to entering and clearing vessels arriving at the ports of Ancon and Cristobal, filing manifests, recording protests, and the usual services to seamen. Docks were constructed at those ports equipped with modern appliances.

In the division of internal revenues distillation licenses to the amount of $5,198.95 were collected.

The total number of leases for building lots in force on June 30, 1907, was 479; for agricultural lands 83, the latter covering 344 hectares of land.

The collector of revenues is ex-officio administrator of estates for the Canal Zone, where the decedents were citizens of the United States and the estates consist entirely of personal property not exceeding in value $500. Administration services were performed on 29 estates during the year.

The funds of the Canal Zone are derived from the rental of lands and buildings, the postal service, court costs and fines, and taxes. All expenses of the school system, the cost of public improvements, and the miscellaneous and contingent expenses of the Canal Zone government were defrayed from these funds, with the exception of the revenues from the postal service, which were applied solely toward defraying the expenses of that service.

Civil cases tried and settled in the several courts of the Canal Zone numbered 358. Several decisions of importance were rendered by the supreme court, among them the cases of Coulson and Andrade. In the former case the defendant (Coulson) was convicted in the circuit court of the second circuit of murder and sentenced to death. Dur-

ing the trial of the case the defendant's attorneys moved for a trial by jury, which motion was denied by the court. Upon appeal the decision of the lower court was affirmed. The latter case was one of ejectment, brought in the name of the United States against Andrade to recover possession of lands occupied by him. The defendant, who was in possession of the lands, pleaded the statute of limitations and argued that the government must prove its title to the land. The court held that the statute of limitations does not run against the government and that the burden is always upon a person claiming adversely to the government to prove title.

On June 30, 1907, the effective force of the police department consisted of 181 officers and men. During the year 6,236 arrests were made, from which resulted 5,193 convictions. The large number of arrests was principally due to the influx of foreign labor to the Isthmus who are unfamiliar with the laws of the Zone. The improvements in jails and penitentiaries were made to the betterment of conditions of prisoners. As marshal of the various courts the chief of police served 310 summonses, 663 subpœnas, and levied 4 executions. Acting as coroner he held 136 inquests.

Fire protection throughout the Zone was largely increased by the construction of additional fire stations and the installation of effective fire-fighting equipment. The number of paid members of the force was increased and volunteer companies were organized at the more important points along the line.

The work of the superintendent of public works in Panama was confined to the operation of the waterworks and sewer systems, the letting of contracts for connections with the mains, the enforcement of plumbing regulations and the collection of water rents. This work proceeded satisfactorily, and at the close of the fiscal year 1,023 connections had been made and 133 fire hydrants and 22 public taps

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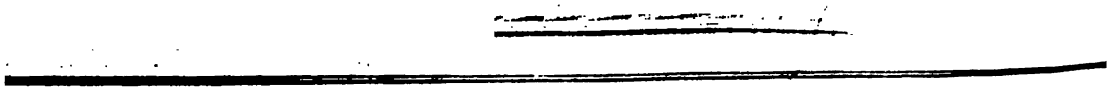
Much attention has been given to the subject of suitable graded schools in the Zone for the benefit of children, especially of Americans employed by the Commission. The average enrollment for the year was 1,643, and the average attendance 1,138. Twenty-four schools were opened during the year at different points. The personnel of the division of schools included 31 teachers. Through a regrading of the salaries of teachers it is hoped that the standard of



the force will be improved, and afford to the children of American employees school facilities as broad in scope and purposes as those afforded by schools in the United States.

Further details in connection with the work of the department of civil administration are given in Appendix G.

SANITATION.

By Executive order of November 17, 1906, sanitation was separated from the department of government, of which it was a division, and created a new department under the Commission.

The work of sanitation was carried on throughout the year, increasing in amount and extent as new engineering construction was undertaken. Its success depends upon the ability to protect employees against the malarial mosquito, and this is accomplished by draining and clearing the ground in the neighborhood of villages, in addition to proper quartering. The following, in brief, is the work done in the Zone along these lines: Brush cut, 16,000,000 square yards; swamp lands filled and drained, 1,000,000 square yards; grass burned, 30,000,000 square yards; ditches dug, 217,000 linear feet; tile ditches laid, 50,000 feet, and cemented, 50,000 linear feet. Other functions were performed in addition, such as the disposal of night soil, the removal of garbage, and the care of cemeteries.

Outside of the limits of the Canal Zone the department performed such sanitary work in the cities of Panama and Colon as was necessary to control health conditions and to keep infection from the Zone. A medical officer with a small force is established at Bocas del Toro to keep the town in such condition as to maintain quarantine against the introduction of yellow fever and to prevent the spread of it should it break out. Yellow fever has been kept out during the year.

Too much credit can not be given the department for the elimination of yellow fever, which permits the successful prosecution of the work. There was no yellow fever originating on the Isthmus during the year, though one case was brought in from shipping, the patient having passed the period of infection.

Six cases of smallpox were taken from vessels entering at Colon; one case was introduced into the city in the early part of the year from Colombia, the disease breaking out four or five days after arrival. From this 35 to 40 cases developed in Colon, but as they were promptly isolated, the people in the neighborhood vaccinated, and the houses concerned carefully fumigated, there was no further spread of the disease in the town and it did not extend to the Canal Zone.

About 3,000 persons who had been exposed to yellow fever or smallpox were held in quarantine for observation.

The largest subdivision of the department has to do with the care of the sick, requiring for its maintenance more than half of the sums appropriated for sanitation. Medical attendance and medicines, both in the hospitals and in quarters, are furnished gratis to employees of the Commission and of the Panama Railroad. To the families of employees a charge is made for treatment.

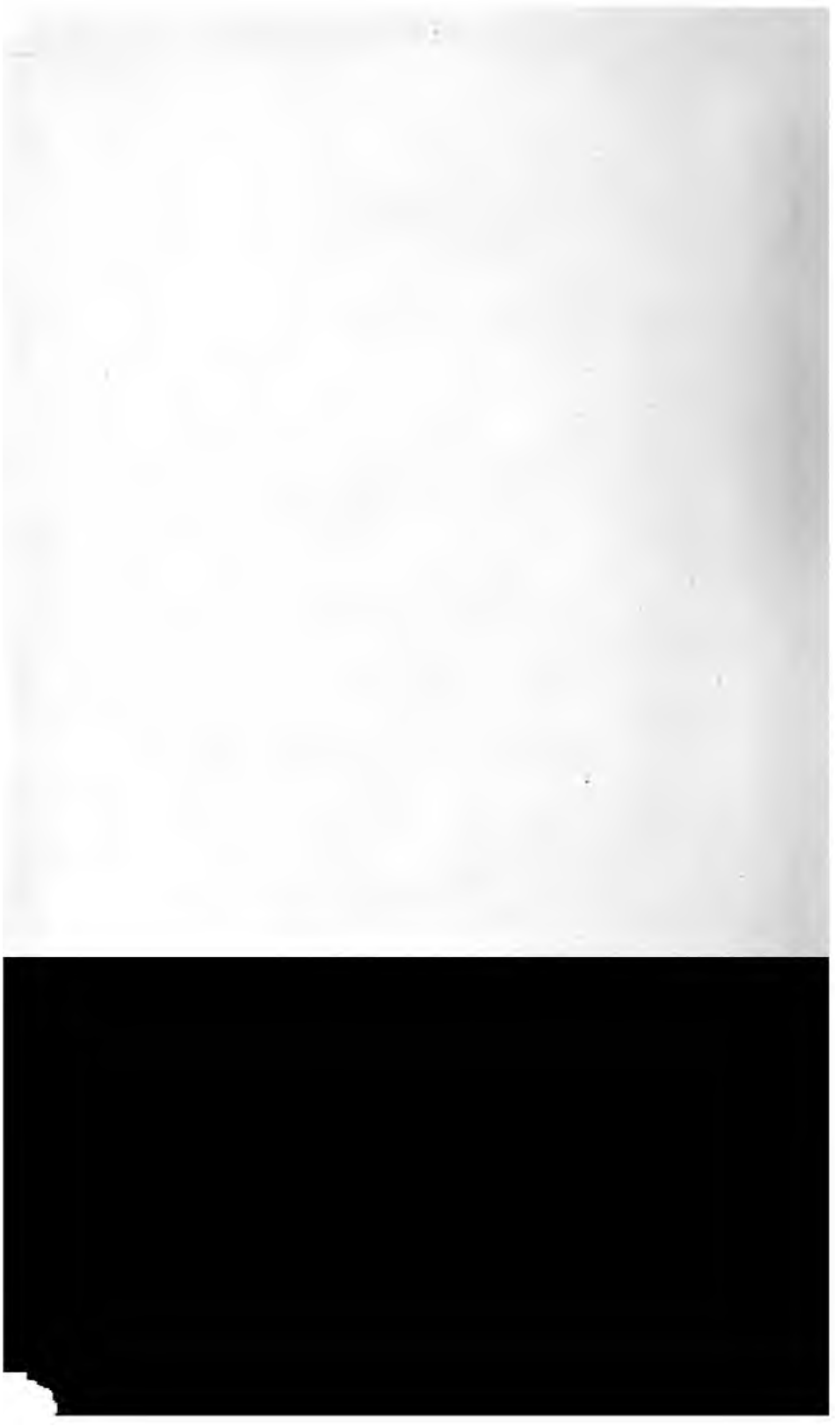
The average daily force of skilled and unskilled laborers of the Commission and Panama Railroad was, at the beginning of the year, 19,600 and at its close 29,446. The average daily sick in quarters and in hospitals for the year was 916. So far as can be determined from such data, a comparison of the death rates among employees for the fiscal years 1905–6 and 1906–7 will show a marked improvement in health conditions during the past year, mainly due to sanitation, and also to better housing facilities and better food supplies. While death rates may be used as a basis for showing improvement in the health conditions on the Isthmus from year to year, they give no data for a comparison of this locality with other communities, because only the healthy in the prime of life are employed, and also because of the migratory character of the laborers, as will be seen by an examination of Appendix F.

During the fiscal year suitable buildings were constructed and the lepers removed to the new colony at Palo Seco.

Five new hospital buildings were constructed within the Zone, additions made to seven of the previously existing wards, and two new wards added to existing hospitals, increasing the number of hospital beds to a normal capacity of 1,845 as against 1,252 at the beginning of the year, and an increase of an emergency capacity of 587 cots. Two buildings have been constructed at Ancon, one a ward for the insane and the other an insane asylum; to these buildings will

PLATE 9.

ANCON HOSPITAL GROUNDS.



DRIVEWAY IN ANCON HOSPITAL GROUNDS.

I. C. C. SANITARIUM AT TABOGA ISLAND.

I. C. C. HOSPITAL AT COLON.

PANAMA RAILROAD.

The progress reported as being made during the previous fiscal year was continued during the past year. The rebuilding of the old line is completed and the building of the new double-track, with the exception of four miles from Gatun to Lion Hill, 90 per cent of which is finished, is complete. Additional sidings and storage tracks, made necessary by the enormously increased business due to Commission dirt trains, were built. A block system of dispatching trains was put into use on the double track, affording the freest possible movement of trains consistent with safety.

During December, 1906, an unusual flood occurred in the Chagres River, which at Matachin, reached an elevation of 78 feet, or 30 feet above low water. Between Mindi and Bas Obispo 15 miles of track were submerged from 1 to 8 feet, but, aside from softening the new double-track bed and washing away about 2,000 cross-ties, no serious damage was done.

The amount of traffic has been so heavy that the 70-pound rails are proving too light and steps have been taken to increase them to 90 pounds, especially on the curves. A new coal-handling plant at wharf No. 14 has facilitated the unloading of coal to such an extent as to reduce the freight rate per ton. The new yards at La Boca are finished.

The service of the steamers operated by the Panama Railroad Company reduced, in lay-over time, one day in the early part of the fiscal year, has been again modified by resuming the former schedule, due not to the fact that the freight could not be handled promptly and efficiently but to the time allowance between the time of arrivals and departures not being sufficient to make the necessary repairs to machinery.

Under the provisions of the last appropriation act new equipment has been added as follows: One hundred Rogers ballast cars; 273 box cars; 10 stock cars; 12 caboose cars; 2 Rogers ballast sand plows; 9 first-class coaches, length 68 feet; 10 second-class coaches, length 68 feet, and 4 baggage and mail coaches, length 68 feet.

COMMISSARY.

Supplies are furnished to the hotels, messes, kitchens, and employees of the Commission and Panama Railroad by the commissary department of the railroad, which has developed into a modern department store. Seven branch stores, located at Gatun, Gorgona, Empire, Culebra, Rio Grande, Paraiso, and Pedro Miguel, are also in operation. In connection with the commissary there are

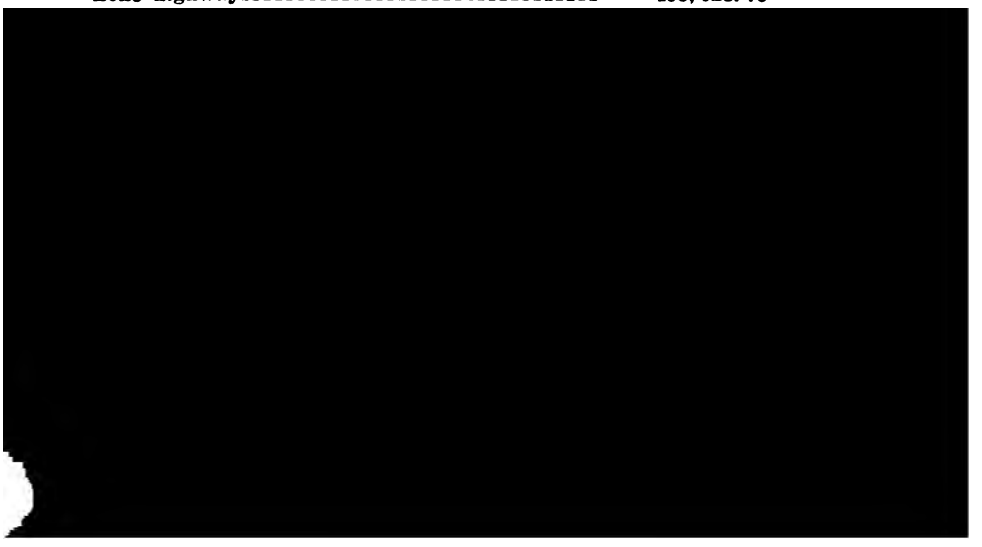
MONEY STATEMENT—continued.

Appropriations—Continued.

Mar. 4, 1907.	Civil administration		$825,000.00
	Pay officers and employees	$486,000.00	
	Pay skilled and unskilled labor	50,000.00	
	Material and incidental expenses	289,000.00	
	Sanitation		2,034,000.00
	Pay officers and employees	766,000.00	
	Pay skilled and unskilled labor	468,000.00	
	Material and incidental expenses	800,000.00	
	Reequipment Panama Railroad		1,385,000.00
	Redemption Panama Railroad bonds		2,298,367.50
	Total appropriation year 1908		$27,161,367.50
	Total appropriations		79,608,568.58

Expenditures.

Construction of canal	$29,782,682.60	
Buildings	5,862,384.90	
Panama waterworks, sewers and paving	1,217,445.52	
Colon waterworks, sewers and paving	763,302.30	
Panama Railroad advances	1,826,683.50	
Total construction and engineering		$39,452,498.82
Government of the Canal Zone	1,431,151.71	
Buildings	338,101.40	
Zone highways	499,023.70	



MONEY STATEMENT—continued.

Expenditures—Continued.

Labor furnished and material sold to Panama Railroad, Republic of Panama, Commission's employees, and other allied interests		$1,950,952.28	
Cash and uncollected bills at various hospitals		2,312.71	
Total miscellaneous		6,422,906.41	
Less:			
Amount due individuals and companies for claims allowed but not paid on this date	$505,375.18		
Amounts unpaid on pay rolls	1,431,746.21		
June rolls $1,290,419.14			
Prior months 141,327.07			
Total amount of collections made and bills rendered and included in expenditures which have been or will be deposited in United States Treasury as—			
Miscellaneous receipts	2,873,146.63		
Value of French material charged to the work or sold to individuals and companies which has been credited to purchase price of canal	648,511.65		
		5,458,779.67	
Net miscellaneous			$964,126.74
Total expenditures			48,285,110.37
Balance available July 1, 1907			31,323,458.21
Total			79,608,568.58

The foregoing tabulated statement of appropriations and expenditures shows that $79,608,568.58 have been appropriated for the construction of the canal between the Atlantic and the Pacific oceans, and that of this amount, at the close of the fiscal year, a total of $48,285,110.37 was expended. The project adopted by Congress was estimated by the Board of Consulting Engineers to cost $139,705,200, exclusive of sanitation and expenses of the Zone government; the estimates submitted did not contemplate or provide for waterworks, sewers, and paving in Panama and Colon, made necessary to secure improved health conditions, nor is any provision made for the re-equipment of the Panama Railroad. Under the circumstances, the foregoing table is prepared with a view to showing the amount expended for the construction of the canal on estimates under which the Commission is operating.

Appendix J herewith is a statement of expenditures classified in accordance with the requirements of the general auditor.

In Appendix K are given the estimates for the fiscal year 1908–9.

ORGANIZATION.

In order that a clear idea may be obtained of the organization of the force employed in constructing the canal, diagrams are submitted showing the divisions and subdivisions of the work and those in responsible charge. (Plates 134 to 145, inclusive.)

Respectfully submitted.

GEO. W. GOETHALS,
Lieutenant-Colonel, Corps of Engineers, U. S. Army,
Chairman and Chief Engineer.

Hon. WM. H. TAFT,
Secretary of War, Washington, D. C.

APPENDIX A.

REPORT OF MAJ. D. D. GAILLARD, CORPS OF ENGINEERS, U. S. ARMY, MEMBER OF ISTHMIAN CANAL COMMISSION, IN CHARGE OF THE DEPARTMENT OF EXCAVATION AND DREDGING.

CULEBRA, CANAL ZONE, *August 21, 1907.*

SIR: I have the honor to submit the following report of operations for this department for the fiscal year:

On April 12, 1907, I was placed in charge of "dredging in the harbors, of building the necessary breakwaters, and of all excavation in the canal prism, except that incidental to lock and dam construction."

CULEBRA DIVISION.

This division extends from the point where the canal first crosses the Chagres, in the vicinity of Gamboa, to the south end of the lock site at Pedro Miguel, a total distance of 9.2 miles.

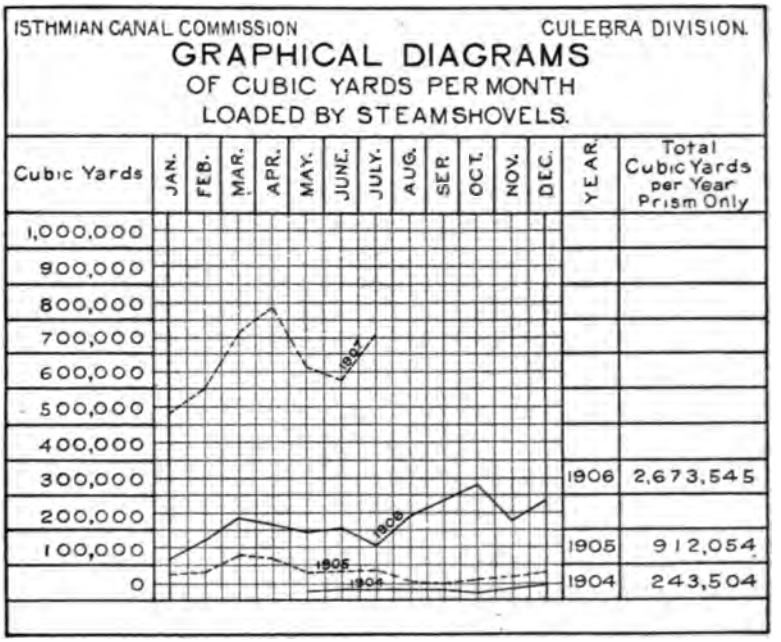
At the time of the transfer to the United States the total of all employees working for the French company numbered only about 700, and most of these were working in the Culebra division.

The total amount of material excavated in the Culebra division for the fiscal years ending June 30, 1904, 1905, 1906, and 1907 is given in the following table:

Amount of material excavated in the Culebra division since the United States assumed control (place measurement).

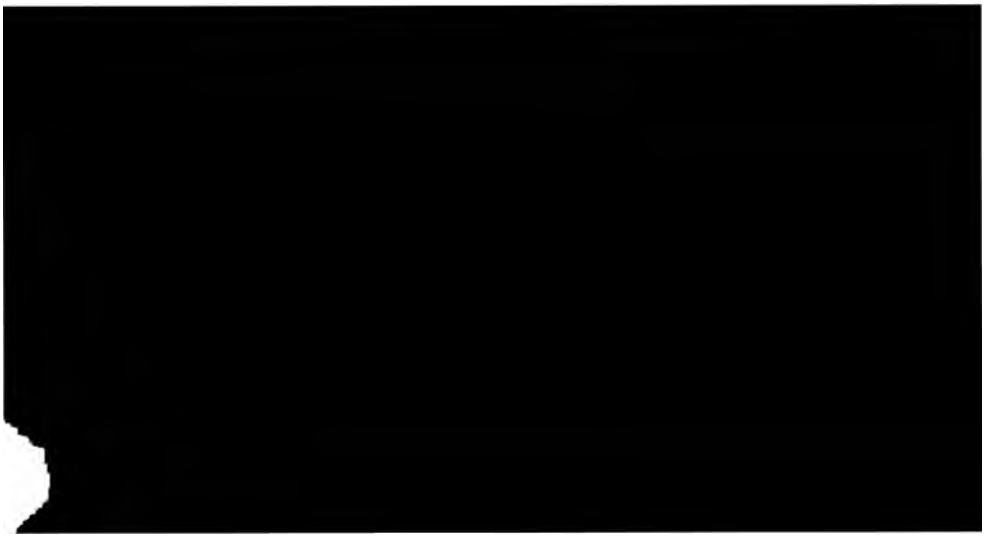
Fiscal year ending June 30—	From canal prism.				Total excavation, including canal prism and accessory works.			
	Earth.	Rock.	Not classified.	Total.	Earth.	Rock.	Not classified.	Total.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*
1904	.....	.....	60,107	60,107	.....	.....	60,107	60,107
1905	327,404	230,875	183,365	741,644	327,404	230,875	183,365	741,644
1906	764,327	742,235	.....	1,506,562	764,327	742,235	.....	1,506,562
1907	2,288,199	3,282,233	.....	5,570,432	2,413,358	3,325,613	29,043	5,768,014
Total.....	3,379,930	4,255,343	243,472	7,878,745	3,505,089	4,298,723	272,515	8,076,327

The amount of material removed in the Culebra division during each month since the United States assumed control in May, 1904, is shown graphically on the accompanying plate.

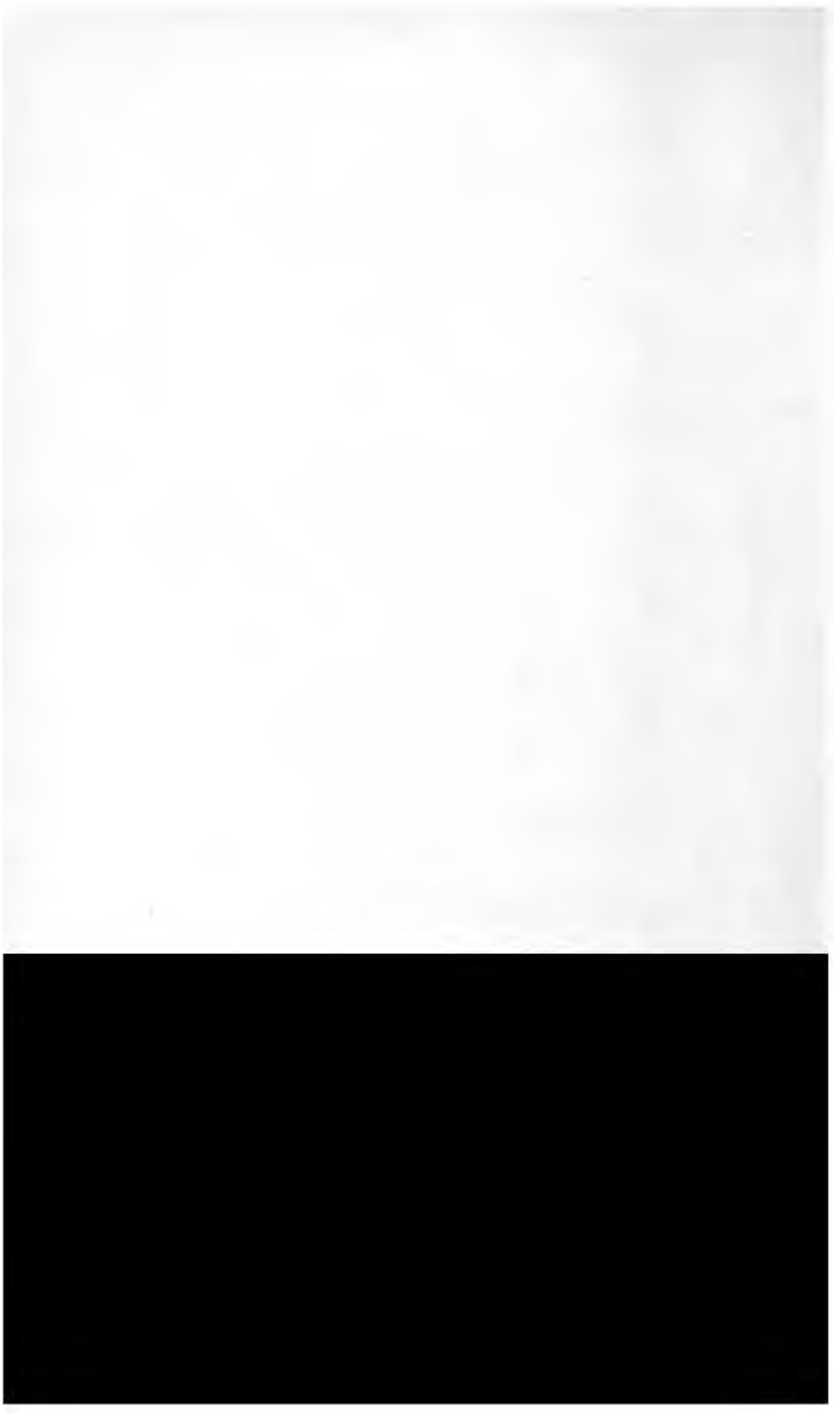


In considering these tables and curves, it must be remembered that previous to January 1, 1907, much of the work done by steam shovels was of a preparatory nature and consequently the output was necessarily less than when the shovels had been established on a regular working basis. Moreover, the average number of steam shovels working during the first half of the fiscal year was only about 20, while for the last half of the fiscal year the average number was a little over 38.

Amount of material excavated monthly in the Culebra division during the fiscal year ending June 30, 1907 (place measurement).



VIEW IN CULEBRA CUT, LOOKING SOUTH, SHOWING GOLD HILL (HEIGHT, 660 FEET) IN THE BACKGROUND.



VIEW IN CULEBRA CUT NEAR EMPIRE, LOOKING SOUTH.

AIR DRILLS AT WORK AT THE FOOT OF GOLD HILL.

AIR DRILLS AT WORK IN THE CUT AT BAS OBISPO.

It will be seen from the above table that the maximum monthly amount of material excavated in the Culebra division during the fiscal year was 879,527 cubic yards, which was removed in April, 1907. This amount exceeds by 75 per cent the maximum monthly excavation, as given in available records, made by the French in the Culebra division, their highest monthly total in the Culebra division being 502,250 cubic yards in February, 1886.

With the exception of a very small proportion of material removed by hand from the quarry in the canal prism at Bas Obispo, all material is handled by steam shovels and dirt trains, and is carried to dumps situated at distances varying from 1 mile to 15 miles, the average haul at present being about 10 miles.

This haul will increase in length, owing to the necessity of using material from the cut in the construction of the dams.

Blasting.—The total amount of material actually mined during the fiscal year was 3,291,856 cubic yards.

The compressed-air plant was put in operation during the month of January, and all drills are now being run by compressed air. During the fiscal year 39 well, or mechanical churn, drills, were in operation, and 139 air drills.

The number of linear feet of holes drilled during the fiscal year, were as follows:

	Lin. ft.	Miles.
Steam and air drilling	442,839 or	83.9
Well, or mechanical churn drilling	167,052	31.6
Hand drilling	100,101	19.0
Total	709,992	134.5

The quantities of explosives used during the year amounted to—

	Pounds.
Dynamite	1,998,655
Black powder	408,385

A total of 1,203.5 tons.

Steam shovels.—At the beginning of the fiscal year 39 steam shovels had been received, but a large number of them had not been put to work. Up to the end of the fiscal year, 63 steam shovels had been delivered, erected, and accepted. At present these shovels are distributed as follows:

Assigned to the Culebra division	52
In Empire shops for repairs	1
Assigned to Gatun	6
Assigned to Panama Railroad	4
Total	63

These shovels are of three sizes, 45-ton, 70-ton, and 95-ton, with dipper capacity of 1¾, 2½, and 5 cubic yards, respectively.

The daily average number of shovels at work during the fiscal year ending June 30, 1906, was 9.17, and for the fiscal year ending June 30, 1907, 29.03.

The number of cubic yards excavated per hour, while under steam, by shovels not engaged in preparatory work, averaged 68 for the fiscal year ending June 30, 1906, and 86 for the year ending June 30, 1907.

The largest output during the fiscal year was made by steam shovel No. 218, a 95-ton shovel, which in 260 excavator days took out 211,055 cubic yards of rock and 42,967 cubic yards of earth, a total of 254,022 cubic yards for the year.

A table showing the performance of steam shovels in the Culebra division for the fiscal year ending June 30, 1907, follows. It must be remembered that this performance is based upon a working day of but eight hours, whereas contractors in the United States usually work their steam shovels about ten hours per day.

Performance of steam shovels, Culebra division, fiscal year ending June 30, 1907.

Month.	Number of working days.	Output per shovel.				Rainfall at—	
		Per day.	Per month.	Per hour under steam.	Per hour at work.	Empire.	Culebra.
1906.		*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Inches.*	*Inches.*
July	25	378	9,441	51	144	14.61	20.26
August	27	536	14,461	73	144	11.84	12.97
September	24	568	13,664	79	142	7.41	6.22
October	27	532	14,373	69	142	3.97	8.46
November	24	459	10,833	66	132	21.05	19 19
December	25	491	12,267	66	132	8.15	9 09
1907							
January	26	702	18,248	95	170	.08	.00
February	23	674	15,966	96	162	.13	.49
March	25	741	18,530	100	174	.16	.08
April	26	765	19,884	104	201	.09	.04
May	26	833	21,674	111	190	6.22	7.45
June	25	651	16,268	90	162	13.53	14.74
Fiscal year	303					87.24	98.99

Transportation.—The plant in operation under the transportation department on June 30, 1907, was as follows:

Locomotives	132
Lidgerwood plows	28
Lidgerwood unloaders	18
Spreaders	12
Lidgerwood flat cars	1,245
12-yard western dump cars	267

Dumps.—During the fiscal year the inside dumps have been almost filled up, so that from this time forward nearly all material will have to be hauled over the Panama Railroad to Gorgona, Mamei, Tabernilla, and Gatun from the north end of the cut, and to dumping grounds on the New Panama Railroad, the Sosa-Corozal dam and La Boca from the south end of the cut.

The Tabernilla dumping ground is the largest of these dumping grounds, and in a short time this dump alone will handle about 12,000 cubic yards a day.

Yards.—The two principal yards, where material is taken from the cut and made up into trains, are at White House and Pedro Miguel. The only new yard of any size projected during the year is on the Tabernilla dump. A large yard is being installed there with the view of carrying material directly from the steam shovels instead of switching and changing engines at White House yard as at present, and it is believed that this proposed method will prove more satisfactory and economical than the method in use at present.

Labor.—The labor situation during the year has been very satisfactory, and at the present time no special difficulty is experienced in securing all the men needed in the various departments of the work. Better foremen are now being secured than in the past, and with more efficient foremen, the laborers themselves will necessarily prove more efficient.

On the Culebra division there are Spaniards, Italians, West Indian negroes, and a few negroes from the United States.

Spaniards and Italians are usually paid 40 cents per hour silver (20 cents gold), and West Indian negroes, when not furnished with meals, 20 cents per hour silver (10 cents gold). The prices just mentioned are for ordinary laborers. Firemen, drill runners, etc., receive higher wages.

The daily average number of laborers employed on the work during the fiscal year was as follows:

Installing new plant	1,119
Blasting	768
Steam shovels	378
Tracks	643
Dumps	1,373
Transportation	264
Engineering	58
Water service	81
Total	4,684

The daily average number in all departments during the previous fiscal year was 2,034.

During the year the wages of the gold employees of the Culebra division have been increased 8 per cent on an average. This increase is almost wholly due to the continued prosperity in the United States, which necessitated an increase in wages in order to hold suitable men on the Isthmus.

Cost.—Considering the total output in the Culebra division for the fiscal year, the average cost of the various items of expense have been as follows:

Arbitrary, to cover cost of plant	$0.1200
Blasting	.1451
Excavation by steam shovels	.1081
Transportation	.1942
Tracks	.0830
Dumps	.1548
General expense	.0193
Total	[a].8245

In the table of costs just given the total cost of blasting has been distributed among the total number of cubic yards of excavation, but to get the real cost it should be applied only to the material actually mined, 3,291,856 cubic yards, making the cost for blasting $0.2557 per cubic yard. In other words, other things being equal, the removal of rock, due to blasting alone, cost $0.2557 more than that of earth.

The item in the table entitled "Arbitrary, to cover cost of plant," is a fixed charge added to the cost of excavation with the idea that this fixed charge added to every cubic yard of material excavated will, by the time the canal is completed, total a sum which will be equivalent to the original cost of the plant, repairs for the plant being included in the cost of operation.

The different items which go to make up this arbitrary charge of 12 cents are as follows:

Item.	Charges per cubic yard U. S. gold.	Remarks.
A. Steam shovels	$0.0075	Includes cost of new shovels set up ready for service.
B. Cars	.0450	Includes cost of new cars.
C. Engines	.0250	Includes cost of new engines and rebuilding of French engines.
D. New appliances	.0100	Includes cost of new appliances, such as unloading plows, spreaders, and unloaders.
E. Track material	.0175	Includes cost of new track material.
F. Structures	.0025	Includes cost of new structures, such as coal pockets, roundhouses, powder magazines, yard offices, etc.

[redacted]

Cost of plant.—The total amount charged to arbitraries for the fiscal year ending June 30, 1907, in the Culebra division was as follows:

Arbitrary—	
A	$576,858.16
B	2,145,792.00
C	2,088,633.17
D	176,083.79
E	679,184.28
F	14,207.59
G	83,109.59
H	8,500.41
Total	5,772,368.99

Nearly all of the large items of plant needed for the Culebra division have been already purchased and are in operation, with the exception of about 300 Lidgerwood flat cars and about 500 dump cars.

Coal consumed.—During the fiscal year 79,500 tons of coal, costing $515,453, were used in the Culebra division. The cost of fuel is a heavy item of expense, and it is hoped that it may be to some extent reduced in the future by the use on stationary engines of crude oil, which it is now possible to obtain from the Union Oil Company of California at an agreed price of 90 cents per barrel. This company has an 8-inch pipe line extending clear across the Isthmus alongside the tracks of the Panama Railroad Company from La Boca to Cristobal.

Change in organization.—The organization which had existed during the previous fiscal year was continued with but little change during the fiscal year ending June 30, 1907, but on July 1, 1907, upon recommendation of Mr. L. K. Rourke, acting division engineer, Culebra division, a new organization was effected. The reorganization consisted in the appointment of an assistant division engineer and in dividing the Culebra division into five construction districts, each under charge of a superintendent of construction responsible for all work in his construction district. This organization affords the means of fixing the responsibility definitely and promptly in case any part of the work is not satisfactory in any one of the construction districts.

The superintendents watch their work more closely and take more personal pride in results obtained when serving in their present capacity than they did when acting as supervisors in a single large construction district.

The new organization has now been tried for over a month and a half. The output has been increased, work is progressing with less friction, and as a consequence of these facts the cost of excavation has been reduced.

The following changes were made in the organization of the Culebra division during the fiscal year:

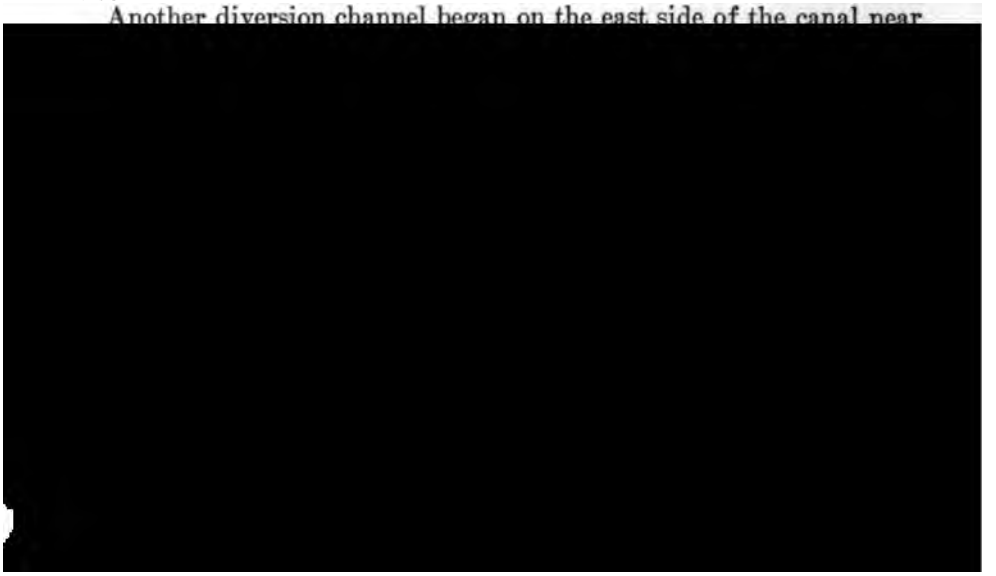
July 11, M. K. Jones, appointed superintendent of transportation.
July 16, Jos. Little, appointed superintendent of excavation.
July 16, D. W. Bolich, appointed acting division engineer.
July 26, L. K. Rourke, appointed superintendent tracks and dumps.
August 31, H. F. Dose, resigned resident engineer.
October 22, A. S. Zinn, appointed resident engineer.
December 1, D. W. Bolich, appointed division engineer.

Proposed diversion channels.—The bottom of the canal, when completed, is fixed at +40 throughout the entire length of the Culebra division, a distance of 9.2 miles. As the cut becomes deeper the question of its drainage will become more difficult and especially is this the case on the northern portion of the Culebra division. At the north end of the Culebra division, where the Chagres crosses the line of the canal, the elevation of the water surface of the river at dead low water is about +44, and during the rainy season, under normal conditions, the elevation of the water surface at this point varies from about +46 to +50; but during the great flood of December, 1906, the water surface there reached an elevation of +79.9. It is, therefore, evident that when the canal is approaching completion, a barrier or dam must be placed at the northern end of the Culebra division, near the river, to keep out the waters of the Chagres, and that the larger part of the drainage of the canal must be carried to the south, where the land slopes more rapidly toward the Pacific.

It will, however, probably be necessary to install centrifugal pumps at the north end of the Culebra division at this point in order to dispose of the water which will come down into the cut and can not conveniently be carried off by natural drainage to the south. It is very important to divert from the canal, for construction purposes as well as for economy in maintenance after the canal has been completed, all possible water which would get into it from the adjacent watershed. It is therefore proposed, during the next fiscal year, to repair and put into operation the old French diversion channel extending from Culebra and emptying into the Chagres on the west side of the canal below Gamboa.

For the diversion of the waters on the east side of the canal between Culebra and Cascadas the French engineers had proposed and partially constructed a diversion channel which would receive the waters of the upper Obispo River, and would carry them across the canal on a high steel or iron aqueduct at Empire and discharge them into the diversion channel on the west side of the canal. The bottom of this aqueduct was to be at an elevation of about 180 feet above the water surface of the canal.

Another diversion channel began on the east side of the canal near



shovel engineers demanded an increase to $300 per month and the cranemen to $250 per month. The matter was refered to the authorities at Washington, and it was decided that an increase of 5 per cent per annum should be paid to these and certain other employees at the end of one year's service and 3 per cent additional increase at the end of each succeeding year of service. This decision was unsatisfactory to a large number of the steam shovel engineers and cranemen, and between May 8 and 13 so many of them had quit work or resigned that the output fell from 33,231 cubic yards on the former date to 8,013 cubic yards on the latter date, at which time but 13 shovels were working.

By the promotion of deserving subordinates and by the return to work of some of the dissatisfied men, the force of steam shovel engineers and cranemen was gradually increased until by the close of the fiscal year things were on a normal basis and the full number of engineers and cranemen needed for the steam shovels were available.

It should be stated that during this entire affair no personal ill feeling between the officials in charge of the work and the dissatisfied employees developed, and no injury or damage whatever to persons or property resulted during the entire affair.

In comparing the cost of work upon the Isthmus with that of similar work in the United States, certain conditions existing in the former locality must be taken into consideration. The wages paid for skilled labor on the Isthmus are, on an average, from 40 to 70 per cent higher than the same class of laborers receive in the United States. Their working day here is but eight hours in length, while on private enterprises in the United States the working day is usually ten hours.

In the greater portion of the eastern and southeastern part of the United States the price of soft coal does not exceed from $3 to $3.50 per ton. The coal used on the Culebra division during the fiscal year ending June 30, 1907, cost $6.48 per ton. Could this coal have been purchased for $3.25 per ton it would have reduced the cost of all excavation in the Culebra division for the fiscal year by 4½ cents per cubic yard.

Owing to the long distance from the source of supply, machinery and material of all classes are more expensive than in the United States.

In addition to these disadvantages, the climate is not one conducive to great physical and mental activity, and the rainfall is so heavy—averaging about 95 inches per annum for the Culebra division—that it interferes considerably with the rapid prosecution of work. This can readily be appreciated when it is remembered that the greater part of this rainfall occurs during the eight months comprising the rainy season.

CHAGRES DIVISION.

This division extends from the deep water of Lake Gatun to the point where the canal crosses the Chagres River in the vicinity of Gamboa.

No construction work had been done on this division previous to the end of the fiscal year.

A survey party was organized about the 15th of January, and has cut a line about 30 feet wide from Limon Bay nearly to mile 18, measuring accurately, and permanently marking the center line of the canal. Cross sections of the canal have been made at intervals

of 100 feet, and monuments set at all points of intersection and other controlling points on the line. This work is now proceeding satisfactorily, and will be continued to the south end of the Chagres division.

Until this survey has been completed it is not possible to tell accurately the amount of material which must be removed from the Chagres division, or to give accurately the classification of such material.

From the best data now available it is believed that the total amount of material to be removed in the Chagres division will be about 13,000,000 cubic yards, of which it is believed that a little less than one-third is rock.

The Chagres River crosses the center line of the canal 23 times within the limits of the Chagres division. As a consequence, a considerable part of the area adjacent to the center line of the canal is subject to overflow at times of high floods in the Chagres, and work in places on this division will, consequently, be liable to frequent interruption during the rainy season.

It is very desirable that all parts of the canal should be finished at about the same time, so that delay in completing any particular section of the canal would not delay the time of opening the canal to commerce. For this reason operations upon the Chagres division should be commenced at an early date in order that no doubt may exist as to the time of final completion of this section of the work.

The total quantity of material to be removed is not so large, but conditions are not favorable for the rapid prosecution of work on this division, and where rate of progress can not be foretold accurately in advance, it is well to be on the safe side.

It is expected that a division engineer, to be placed in charge of the Chagres division, will report in July, and upon his arrival he will be instructed to proceed at once to make preparations for commencing work upon this division.

COLON DREDGING DIVISION.

The Colon dredging division extends from the locks at Gatun to

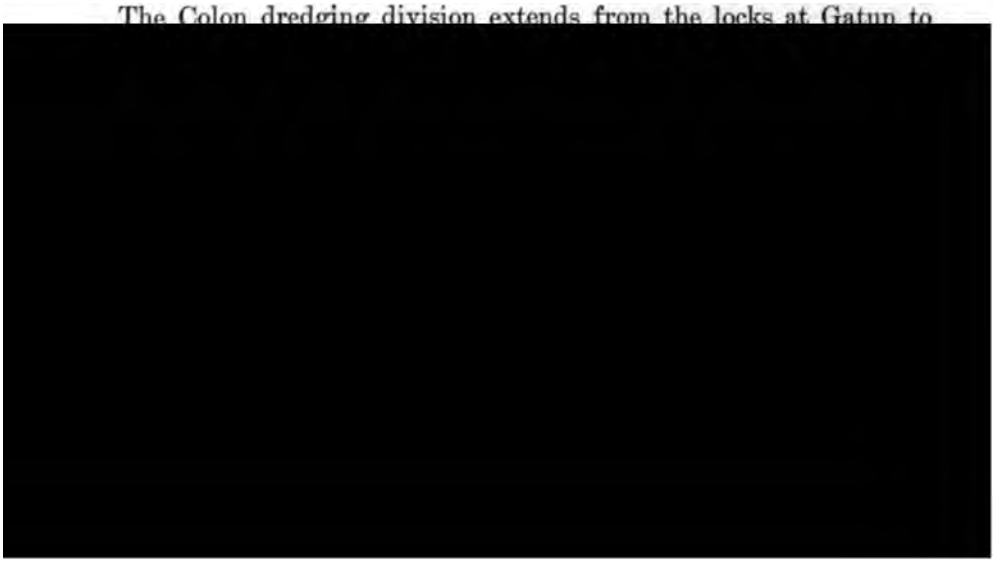


PLATE 17.

WELL OR CHURN DRILL AT WORK ON WEST SIDE OF CANAL, ABOUT ONE-HALF MILE NORTH OF CONTRACTOR'S HILL.

LOADING WELL-DRILL HOLES, 30 FEET DEEP, WITH DYNAMITE, ON WEST SIDE OF CULEBRA CUT ABOUT ONE-HALF MILE NORTH OF CONTRACTOR'S HILL.

VIEW BEFORE FIRING BLAST OF SEPTEMBER 19, 1907, ON WEST SIDE OF CANAL AT BAS OBISPO. FOUR HOLES DRILLED, DEPTH 78 FEET; 9,600 POUNDS OF BLACK POWDER USED. 29,640 CUBIC YARDS OF ROCK DISPLACED.

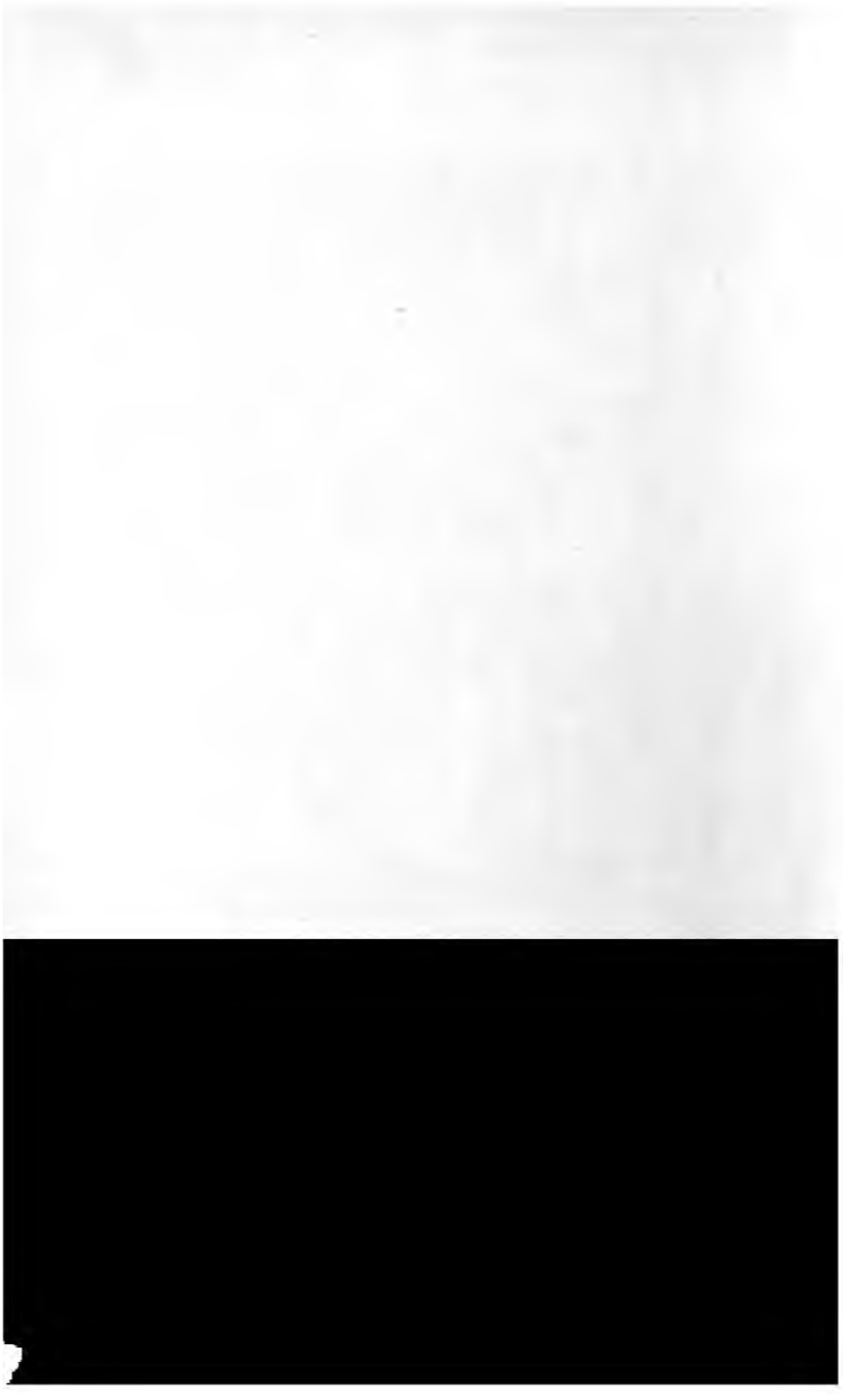
EXPLOSION IN PROGRESS. BLAST OF SEPTEMBER 19, 1907, AT BAS OBISPO.

VIEW AFTER FIRING BLAST OF SEPTEMBER 19, 1907, AT BAS OBISPO.

STEAM SHOVELS LOADING LIDGERWOOD FLATS ON EAST SIDE OF CULEBRA CUT JUST SOUTH OF GOLD HILL.

PLATE 23.

STEAM SHOVEL LOADING TWELVE-YARD WESTERN DUMP CARS ON WEST SIDE OF CULEBRA CUT AT CONTRACTOR'S HILL.



STEAM SHOVEL LOADING TRAP ROCK INTO LIDGERWOOD FLATS AT OBISPO.

ROCK CHANNELER AT WORK ON 95-FOOT BERM ON EAST SIDE OF CUT AT BAS OBISPO.

LOADED LIDGERWOOD FLATS IN WHITEHOUSE YARD, WHERE MATERIAL IS BROUGHT FROM THE CUT AND MADE UP INTO TRAINS FOR THE DUMPS TO THE NORTH.

DUMP AT EAST LA BOCA IMMEDIATELY AFTER HEAVY RAIN

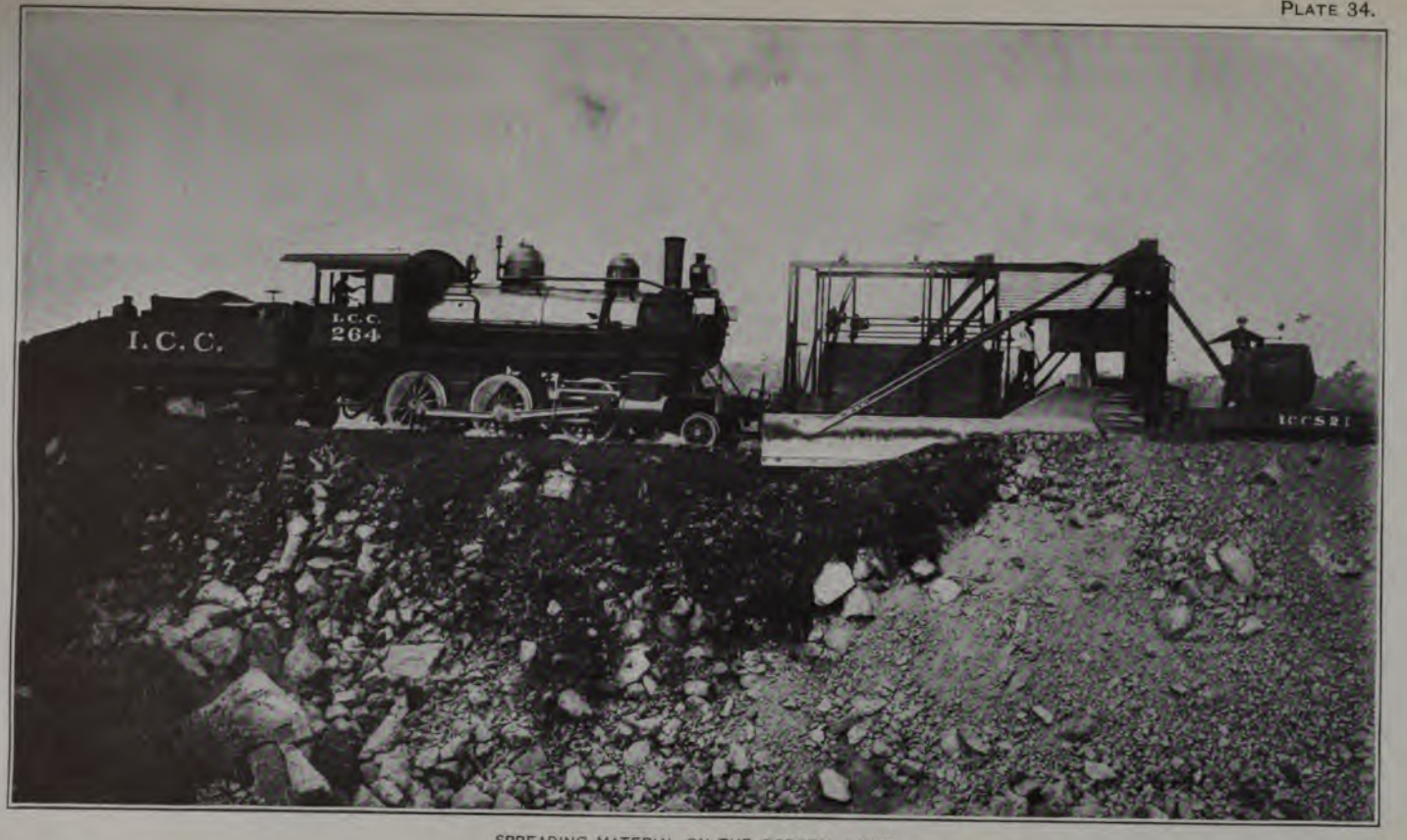
TRESTLE DUMP JUST OUTSIDE OF EAST TOE OF THE SOSA-COROZAL DAM. ANCON HILL AND ANCON HOSPITAL BUILDINGS IN THE BACKGROUND.

TRACK-THROWING MACHINE ON THE DUMP AT TABERNILLA.

THROWING TRACK BY HAND IN THE CUT AT BAS OBISPO.

PLOWING OFF A TRAIN OF LIDGERWOOD FLATS ON THE TABERNILLA DUMP.

DUMPING MATERIAL FROM TWELVE-YARD WESTERN DUMP CARS.



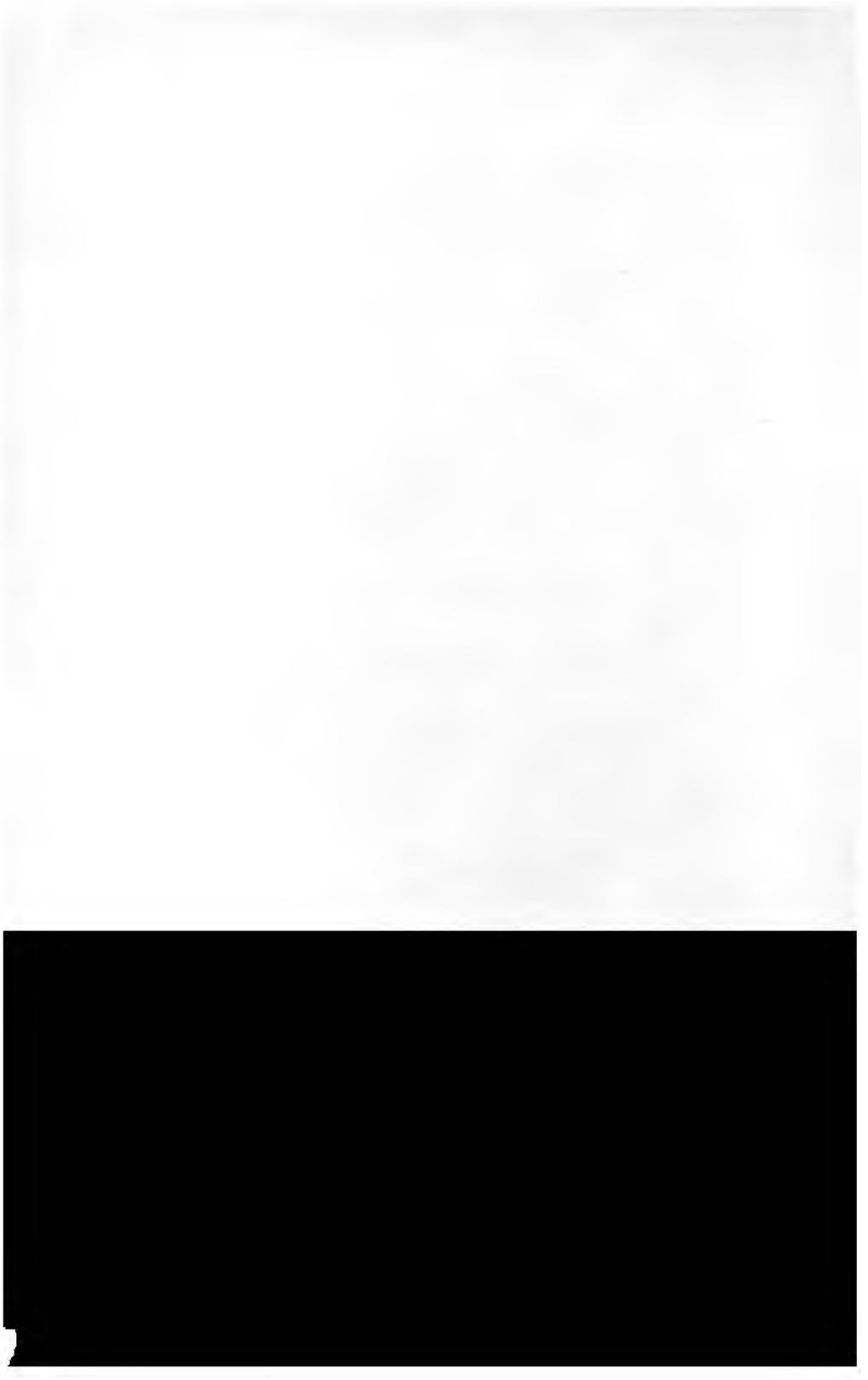
SPREADING MATERIAL ON THE COROZAL DUMP.

SEAGOING SUCTION DREDGE "ANCON" TAKING ON COAL NEAR DRY DOCK AT CRISTOBAL.

SIXTEEN-INCH SUCTION DREDGE WORKING IN CANAL PRISM AT MINDI.

DRY DOCK AT CRISTOBAL AT BEGINNING OF WORK OF ENLARGEMENT.

DRY DOCK AT CRISTOBAL. THIS DOCK WILL ADMIT VESSELS NOT EXCEEDING 298 FEET IN LENGTH, 50 FEET IN WIDTH, AND 15 FEET DRAFT.



FIVE YARD DIPPER DREDGE IN THE ENTRANCE CHANNEL IN THE PACIFIC NEAR LA BOCA. THE DREDGE IS LOADING MATERIAL INTO AN OLD FRENCH SELF-PROPELLING HOPPER BARGE KNOWN AS A "CLAPET."

OLD FRENCH LADDER OR ELEVATOR DREDGE DEEPENING ENTRANCE CHANNEL IN THE PACIFIC NEAR LA BOCA. THIS DREDGE IS BEING SERVED BY TWO OLD FRENCH SELF-PROPELLING HOPPER BARGES, KNOWN AS "CLAPETS."

Dredging.—At the beginning of the fiscal year dredge No. 1, an old French ladder dredge, was operating in the slip leading to the dry dock, and continued working there until August 27, removing 77,000 cubic yards, of which about 10,000 cubic yards were coral. It was then moved into the old French canal opposite the dry-dock slip for the purpose of cutting a 20-foot channel through to Boca Mindi. It was operated until about the 1st of November in the old French canal, and removed 180,447 cubic yards. The dredge was then in poor condition, and repairs to dredge No. 6 (an old French ladder dredge) being finished, dredge No. 1 was taken out of service. Dredge No. 6 began excavating in the old French canal above the dry-dock slip November 7, 1906, and has removed 490,240 cubic yards, of which 17,000 cubic yards were from the new canal prism in the Bay of Limon.

The small 16-inch suction dredge which has been used in filling low places in Colon, was moved into the old French canal, about 1 mile above the dry-dock slip on the 15th of September, and began excavating material and pumping it ashore. She continued operations in the old French canal until the end of the fiscal year, removing 279,484 cubic yards.

A new 5-yard dipper dredge, built by the Atlantic, Gulf and Pacific Company, was tested and accepted March 7, 1907, since which time the dredge has been employed in excavating in the old French canal, where there was a bed of coral, and has removed 35,102 cubic yards.

It will be seen from what precedes that much of the greater portion of material excavated by dredging during the fiscal year was taken from the old French canal, and forms no part of the material to be taken from the prism of the canal now under construction by the United States. The work was necessary for the purpose of getting material, by water, to the vicinity of the Gatun locks and dams. Without this work it would be impracticable to transport the immense amount of material needed in construction work at Gatun.

Dredging plant.—The dredging fleet now consists of one old French ladder dredge, one 5-yard dipper dredge, and one 16-inch suction dredge. The dipper dredge is fitted with a 5-yard dipper for soft material, and a 3½-yard dipper for rock, and is capable of dredging to 42 feet. The hull is of steel, 110 feet long, 38 feet wide, and 10 feet deep. This dredge cost $102,500. There is under contract with the Featherstone Foundry and Machine Company a dipper dredge similar to that just described, which is to cost $100,000 delivered at Colon. This dredge should reach the latter place soon after the end of the fiscal year.

A contract has been made with the Maryland Steel Company of Sparrows Point, Md., for two seagoing suction dredges—the *Ancon* and *Culebra*—similar to the *Manhattan* and *Atlantic*, now operating in New York Harbor. Each of these boats has a length of about 288 feet, molded beam 47½ feet, molded depth of 25 feet, and is propelled by twin screws. They are each equipped with two 20-inch pumps, capable of digging to a depth of 40 feet. Their hoppers have a nominal capacity of about 2,000 cubic yards. The dredges are to be delivered at Sparrows Point, Md., at a cost for the two of $724,850, without equipment. Their hulls have both been launched, and the

This dredge (*A2*) spent 5,832 hours during the fiscal year in actual dredging; 501 hours undergoing repairs due to breakdowns; 966 hours in placing plant, changing crews, and other delays chargeable to dredging operations; 168 hours' delay were caused by passing ships, storms, and delays not chargeable to operation, and 1,293 hours were due to Sundays and holidays.

A total of 1,213,597 cubic yards of soft material, place measurement, was removed by this dredge during the fiscal year, and the total cost of repairs, supplies, and wages of crews amounted to $125,463.95, making the cost per cubic yard of material removed for operation of dredge about 10⅓ cents.

The cost of dredging in this locality would be much cheaper were it not for the high price of coal—which costs $7.50 a ton delivered on board the dredges. The salaries paid the crews are also higher than are those paid for similar work in the United States. When these facts and the great tidal range are taken into account the figures given do not appear excessive.

Dredging plant.—The dredging fleet on the La Boca dredging division now consists of one old French ladder dredge and one 5-yard dipper dredge. A second old French ladder dredge is now being repaired and will probably be put in commission about October 1, 1907. A seagoing dredge—the *Culebra*—of the same type as the *Ancon*, which has already been described in the Colon dredging division, will be completed about October 1, 1907, and will make the trip around Cape Horn under her own steam, probably arriving at Panama sometime in January, 1908.

The ladder dredges and dipper dredges will be served by seven old French self-propelling dump barges ("clapets"), and by three steel-hopper barges of a capacity of about 350 cubic yards each. The hopper barges are now under contract and will not arrive on the Isthmus for several months.

The total amount of material excavated by dredging, both in the canal prism and in accessory works in the La Boca dredging division, during the fiscal year is given in the following table:

Excavation by dredges, La Boca dredging division, since the United States

PLATE 41.

R DREDGE WHICH IS BEING PUT IN COMMISSI

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Monthly excavation by dredges, La Boca dredging division, fiscal year ending June 30, 1907 (place measurement).

Month.	From canal prism, soft material.	From accessory works, soft material.	Grand total, canal prism and accessory works.
1906.	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*
July		98,400	98,400
August		111,930	111,930
September		105,780	105,780
October		97,170	97,170
November		92,988	92,988
December		90,528	90,528
1907.			
January		94,710	94,710
February		93,480	93,480
March		92,319	92,319
April		104,855	104,855
May		122,157	122,157
June	64,352	67,228	131,580
Fiscal year	64,352	1,171,545	1,235,897

Machine shop.—The machine shop at La Boca is now fairly well equipped for marine work, and has accomplished much useful work in rebuilding and repairing floating equipment, such as "Clapets," launches, water boats, lighters, pontons, electric cranes, etc.

Changes in organization.—Prior to February 1, 1907, this division was under the immediate charge of Mr. Wm. Gerig, division engineer. Since that date it has been under the immediate charge of Mr. W. G. Comber, division engineer.

Respectfully submitted.

D. D. GAILLARD,
Major, Corps of Engineers, U. S. Army,
Member Isthmian Canal Commission,
In Charge Department Excavation and Dredging.

Lieut. Col. GEORGE W. GOETHALS,
Corps of Engineers, U. S. Army,
Chairman and Chief Engineer, Isthmian Canal Commission, Culebra, Canal Zone.

that division to do a certain amount of this work in connection with adjacent excavation.

The total excavation from the lock site during the year was 162,094 cubic yards.

At the end of the year explorations by means of test pits and holes were under way, with a view of determining the feasibility of joining these locks for their guide walls to the hills on either side by short concrete dams, and thus avoid the construction of an earthen dam.

LA BOCA LOCKS.

On the lock site 92 holes were bored, aggregating 2,352 linear feet, 1,232 feet of which were wash borings and the remaining 1,120 feet diamond-drill borings in trap rock. A hard trap-rock foundation was found upon which to build the locks.

Railway tracks were located on the south face of Sosa Hill, and a steam shovel was started on August 20 on the excavation of the lock site. Five hundred and thirty-eight cubic yards of trap rock were excavated.

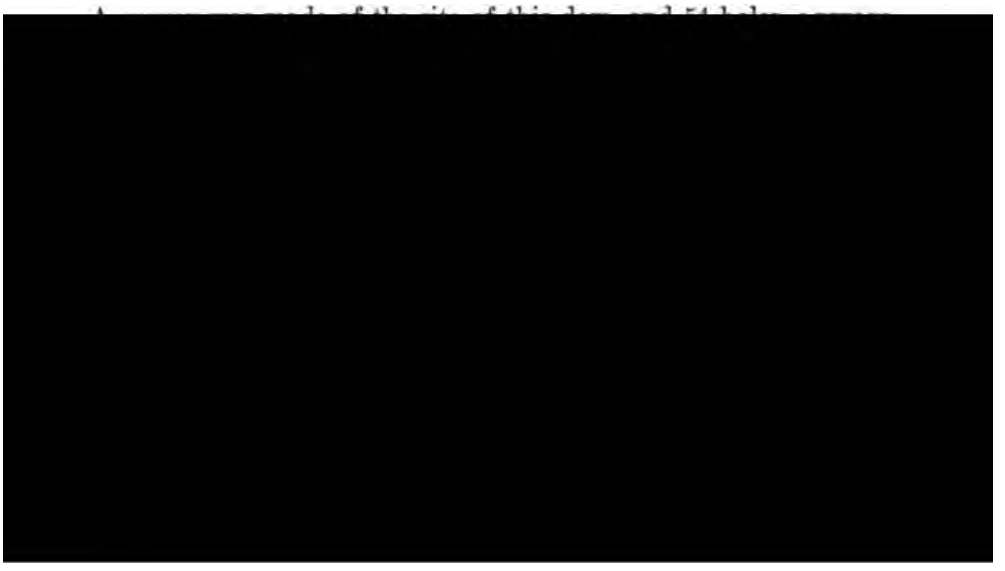
Prepared profiles and requisitioned necessary material for trestle needed in making a construction yard on both sides of the locks.

The general design of these locks is nearing completion, the Commission having passed upon all essential points.

The conclusions as to types of gates and movable dam above the locks, if one be built, are the same as in the case of the Gatun locks.

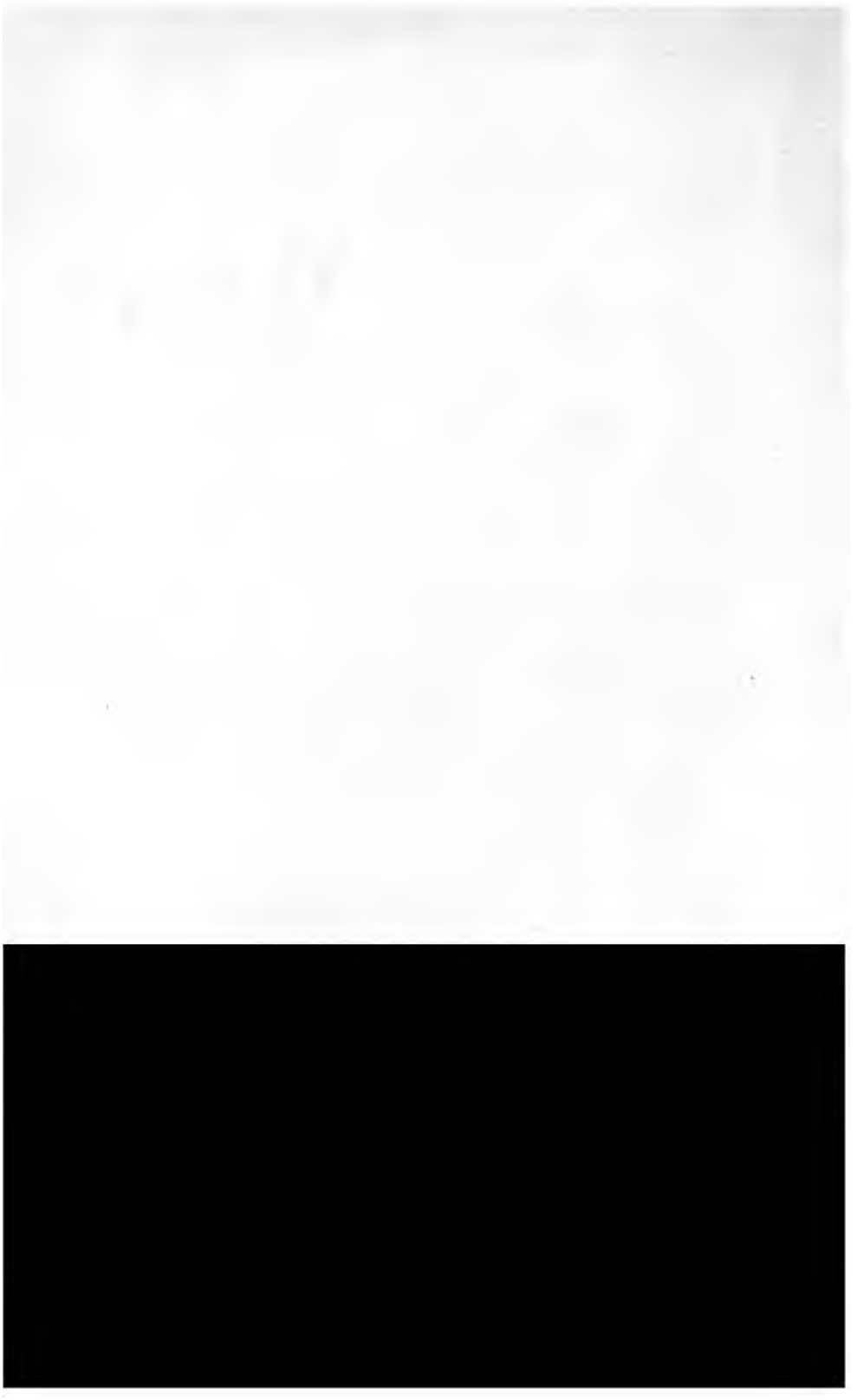
Preliminary investigations showed indications of sand suitable for concrete at Chorera Beach, but after a detailed survey of about 6 miles of coast it was developed that suitable sand was insufficient in quantity. Surveys are now being prosecuted at Chamie Point, 22 miles from La Boca, with good prospects of an abundant supply. Plans and specifications for six seagoing steel barges for transportation of sand have been prepared and bids requested for building and furnishing such barges.

LA BOCA-SAN JUAN DAM.



EXCAVATION FOR LOCK SITE AT GATUN AUGUST 10, 1907.

CLOSING OF THE CHAGRES RIVER AT GATUN.



EXCAVATION FOR SPILLWAY AT GATUN.

SOSA-COROZAL DAM. STATUS OF WORK SEPTEMBER 7, 1907.

trestle along the west toe of this dam were made and the necessary material requisitioned.

Two 20-inch pipe-line suction dredges are under contract for use in the construction of this dam and of the La Boca-San Juan dam. All preliminary preparations necessary are being made, so that these dredges can be placed at work as soon as delivered.

Plate 45 shows status of this work at the end of the year.

SPILLWAYS.

Completed 119 test borings for foundation for a temporary spillway on north side of Sosa Hill.

Completed the surveys through the saddle adjoining San Juan Hill to the west with a view of developing a suitable permanent spillway site.

DRAINAGE DITCH.

This ditch is intended to drain the swamp east of the Sosa-Corozal Dam and extends from this dam through the swamp between Ancon and Sosa Hill to the sea. It is 9 feet deep and 20 to 25 feet in width. Actual excavation commenced about March 1, 1907. Dredge is now about 300 feet beyond the gravel pike and working inland. In all, about 11,300 cubic yards, place measurement, have been excavated, most of which required blasting, as a rock ledge was encountered from 2 to 5 feet below the surface. During the first seventeen days of June the dredge was laid up for repairs.

One hundred and seventeen holes, aggregating 1,557 linear feet, have been bored on this site to date.

MISCELLANEOUS.

In addition to the surveys and maps of the sites of the locks, dams, and spillways, maps were made showing private property lines in the vicinity of La Boca, buildings to be removed for lock construction, sites for quarters and labor camps, sites for new machine shops and dry docks, East La Boca town site, diversion east of the Panama Railroad from Miraflores to Panama, property in the vicinity of Biablo Hill, profile of borings along the Panama Railroad from Ancon Hill south.

In connection with the surveys and examinations incident to this map work 669 holes, having a total depth of 22,248 linear feet, were driven.

The rainfall for the year at La Boca was 63.16 inches.

METEOROLOGY.

Three meteorological stations were in operation at the end of the year at Naos Island, Ancon, and Bas Obispo. A fourth station was authorized at Cristobal and will be placed in operation July 1. Eight rain-gauge stations were in operation during the year. Regular weather observations are made at all stations, and in addition special observations are made at Ancon of seismic disturbances and at Bas Obispo of evaporations; also tabulations of hourly values of wind,

velocity and direction at Naos and Bas Obispo, and records of tides and special observations of air and water temperatures for the Department of Ocean Meteorology of the United States Weather Bureau are made at Naos.

RIVER HYDRAULICS.

The work done under this head has for its object the prediction of freshets and the determination of the amount of water per year that would enter the lakes of the Isthmian Canal, together with the expected loss of water due to evaporation.

At Alhajuela continuous rain gauge and fluviograph observations were made from October 13, 1906, to June 30, 1907. Similar observations were made at Gamboa and Bohio during the entire fiscal year. These observations, however, were not sufficient to determine the maximum annual amount of water entering the lakes. And in April, 1907, gaugings of the Trinidad and Gatuncillo rivers were started, and a station was established at Gatun for the purpose of measuring the discharge through the several channels at that point; the plan being to establish fluviograph stations at Gatun on the upper Trinidad and on the Gatuncillo River, from which it is hoped to get a relation between the total flow entering the Gatun Lake and that passing down the Chagres at Bohio, at which latter station records are in existence covering a long period of time. The short time available, however, within which to determine this relation has led to the conclusion that the watersheds of the two lakes should be developed for the purpose of determining in another way, as a check, the amount of water that should enter the lakes. This information is essential in the design of the spillways.

Very respectfully,

WM. L. SIBERT,
Major, Corps of Engineers, U. S. Army,
Head of the Department of Lock and Dam Construction.

Lieut. Col. GEO. W. GOETHALS,
Corps of Engineers, U. S. Army,
Chairman and Chief Engineer Isthmian

PAY CAR ON GATUN DAM SITE.

APPENDIX C.

REPORT OF THE HEAD OF THE DEPARTMENT OF MUNICIPAL ENGINEERING, MOTIVE POWER AND MACHINERY, AND BUILDING CONSTRUCTION.

SEPTEMBER 24, 1907.

SIR: I have the honor to forward herewith report of operations and expenditures of the department of municipal engineering, motive power and machinery, and building construction, for the fiscal year ended June 30, 1907.

Very respectfully,

H. H. ROUSSEAU,
Head of Department of Municipal Engineering, Motive Power and Machinery, and Building Construction.

Lieut. Col. GEO. W. GOETHALS,
Chief Engineer.

CULEBRA, CANAL ZONE, *June 30, 1907.*

DIVISION OF MUNICIPAL ENGINEERING.

The work performed by the division of municipal engineering during the fiscal year ended June 30, 1907, may be divided into two classes:

Class 1, work done outside of the Canal Zone, in the cities of Panama and Colon, in laying pavements and constructing waterworks and sewerage systems.

Class 2, work done in the Canal Zone, consisting of paving, road making, grading, construction of waterworks and sewerage systems, and miscellaneous work of a similar nature.

The total expenditures in this division for the fiscal year amounted to $1,741,953.90, which was about equally divided between the above two classes.

The general plan of the work covered by class 1 has been described in previous annual reports of the Commission, and the work during the present fiscal year covered by this report, under class 1, has been in continuation of the general plan adopted at the outset of American occupation of the Isthmus—to take such steps as were considered necessary to construct such works of sanitation as were deemed best for the protection of the lives of the employees of the Canal Commission, as provided by Article VII of the treaty between the United States and the Republic of Panama. This article of the

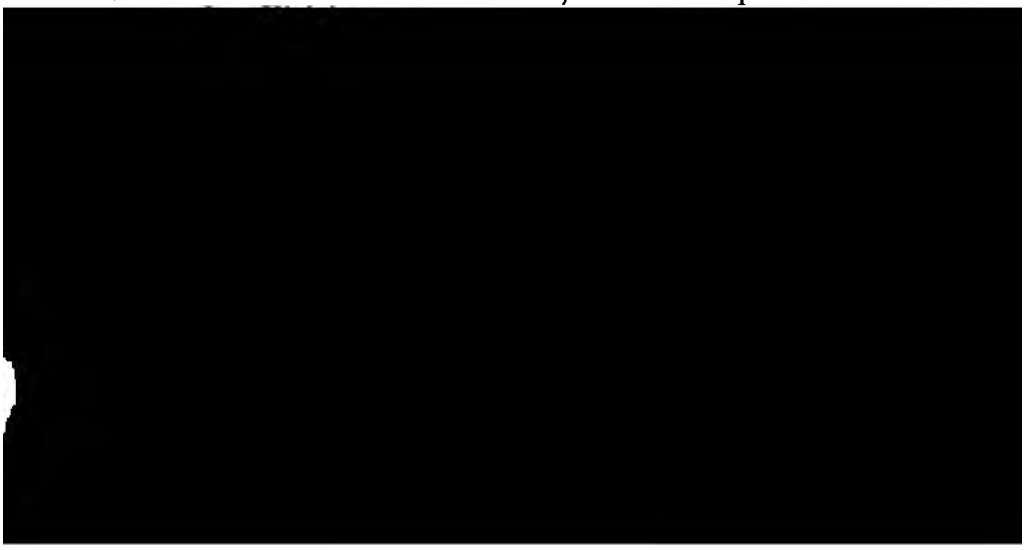
treaty requires that all expenses incurred by the United States for work under class 1, above, shall be repaid, together with all interest charges, through the collection of such water rates as will reimburse the United States within a period of fifty years. The cost of these improvements in the cities of Panama and Colon for work approved to date will approximate $1,750,000, and contracts have been prepared and were entered into shortly after the expiration of the fiscal year authorizing the United States to collect such water rates as will be sufficient to reimburse it for this amount, which includes all expenses for water systems, sewerage systems, and pavements in the cities of Panama and Colon. While these improvements have been paid for out of funds appropriated for the construction of the canal, inasmuch as the United States will be reimbursed therefor the cost of the canal should be credited accordingly. The value of these improvements to the cities of Panama and Colon, which have placed them on a par with cities of the first class in the United States in these respects, can not be overstated. There has been a remarkable increase in the value of real estate in both cities. The saving of lives of the inhabitants due to the improved sanitary conditions can be placed in the hundreds. The standard of living of the inhabitants has been appreciably raised, and their moral and physical welfare has been greatly promoted.

Expenditures under class 2 have been made entirely for improvements in the Canal Zone, necessary for construction work and the health and convenience of Commission employees.

The work covered by the above two classes is described in detail as follows:

PANAMA WATERWORKS.

At the commencement of the fiscal year the waterworks system of the city of Panama can be said to have been completed. During the year extensions have been made, mainly 4-inch lines, in the outlying districts of Cocoa Grove, Calidonia, and Guachapali. The sanitary department, which requested these latter extensions, estimates that this improvement has lessened its expenses at least $15,000 per annum. The extensions are finished, with the exception of one short



The quality of water as regards freedom from bacteria causing disease is remarkable. The consumption of water per capita has increased to about 20 gallons per day.

PANAMA SEWERAGE SYSTEM.

At the commencement of the fiscal year the sewerage system of Panama was complete with the exception of one or two minor details. During the year these were completed, and the following table shows the condition at the close of the fiscal year:

	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total July 1, 1907.
Vitrified sewer pipe:			
6-inch.....linear feet..	1,275.0	925.0	2,200.0
8-inch.....do....	26,946.2	9,057.8	36,004.0
12-inch.....do....	14,659.7	1,604.1	16,263.8
15-inch.....do....	5,037.9	453.0	5,490.9
16-inch.....do....	127.0	.....	127.0
18-inch.....do....	4,973.1	192.1	5,165.2
24-inch.....do....	580.6	.....	580.6
	53,599.5	12,232.0	65,831.5
Concrete storm sewers.....do....	.....	2,096.2	2,096.2
Manholes.....	221	40	261
Catch basins.....	165	62	227

In addition to the sewer system as it was planned there have been two large storm-water sewers built for the purpose of draining the area of Cocoa Grove and Panama Railroad yards. These are concrete sewers and are built for the exclusive purpose of taking care of storm water flowing from an area of about 35 acres.

PANAMA PAVING.

At the commencement of the fiscal year paving had been completed on Central avenue from the Panama Railroad station to and around Cathedral plaza and work was under way on adjoining streets. All brick paving in the city was completed on April 3, 1907. All paved streets have been made of sufficient width for the passage of two teams. The following table shows in detail the work accomplished during the year:

	July 1, 1906.	July 1, 1906 to July 1, 1907.	Total.
Grading.....cubic yards..	13,021	21,725	34,746
Concrete foundation.....square yards..	33,114	9,056	42,170
Concrete curb.....linear feet..	20,285	29,066	49,351
Brick pavement.....do....	15,486	11,963	27,449
Brick pavement.....square yards..	38,900	26,177	65,077
Brick pavement.....number.....	2,307,760	1,922,297	4,230,057
Macadam foundation.....square yards..	6,342	16,565	22,907
Macadam pavement.....linear feet....	.....	1,469	1,469
Macadam pavement.....square yards..	.....	2,746	2,746
Pavement regrouted.....do....	1,646	6	1,652
Concrete pavement.....do....	28	19,088	19,116
Sidewalks.....do....	40	25	65

At the close of the fiscal year paving in Panama on existing streets had been practically completed. There remained to be laid pavements in some of the suburban settlements, and in addition the

necessity will soon arise for the laying out of additional streets in the city of Panama proper. All work of this character necessary for sanitation and for which the Government of Panama cares to assume the amortization cost will be taken up as the necessity develops.

COLON WATERWORKS.

A description of the waterworks system in Colon may be found in last year's report. This system is practically complete. During the fiscal year covered by this report the following pipe was laid:

	Feet.
2½-inch pipe	2,000
4-inch pipe	1,678
6-inch pipe	24
8-inch pipe	254

The following service connections were made:

House connections	755
Service boxes installed	414
Meters tested and set	122

COLON SEWERAGE SYSTEM.

The sewerage system west of D street comprises the city of Colon, as built up, and was completed during the fiscal year ending June 30, 1907.

The following work has been done:

Vitrified pipe:	Linear feet.
6-inch	16,444
8-inch	2,172
10-inch	1,941
12-inch	1,440
15-inch	65
18-inch	170

Cast-iron pipe:	Linear feet.
6-inch	1,563
8-inch	66
12-inch	644
Galvanized pipe:	
20-inch	16

On cross drains there has been laid 583 linear feet of 15-inch, 138 linear feet of 18-inch, and 656 linear feet of 20-inch vitrified pipe; 16,300 cubic yards were excavated and 62 concrete manholes made.

SUMP.

feet ahead of the pavers. As the work progressed the 10-inch main had to be lowered 1 foot for a distance of 700 feet. The work was completed on September 23 and Front street opened for traffic on September 26, 1906. The following tabulation shows brick pavement laid in Colon:

Brick pavement	square yards..	9,031
Curb	linear feet..	3,211
Header for brick pavement curb	do....	2,910
Excavation	do....	2,500

The following is a summary of work on Colon streets during the fiscal year:

Combination curb and gutter	linear feet..	36,993
Macadam	square yards..	43,104
Earth fill	cubic yards..	15,253
Grading	do....	2,218
Excavation for curb trench	linear feet..	15,500
Concrete header constructed	do....	7,965

SURFACE DRAINAGE, COLON.

Sixteen-inch galvanized-iron pipe was laid on Eleventh street, from Bolivar to the beach; Ninth street, from Front to the beach; Seventh street, from Front to the beach; Fifth street, from Front to the beach. In addition, the following vitrified pipe was laid on macadamized streets: Six-inch pipe, 120 feet; 8-inch pipe, 502 feet; 10-inch pipe, 130 feet; 12-inch pipe, 112 feet; 15-inch pipe, 931 feet; total, 1,795 feet.

ROADS, ANCON AND VICINITY.

Shortly after July 1, 1906, the Sabanas road was completed, its crusher removed to quarry near Detention Hospital, Ancon, and road built from Panama Railroad station to the Tivoli Hotel. Road construction has gone on throughout the year in the vicinity of Ancon, and roads have been laid out and graded for the new town at Sosa and East La Boca. Following is a detailed table:

Roads constructed.	To July 1, 1906.	To July 1, 1907.	Total.
	Linear feet.	*Linear feet.*	*Linear feet.*
La Boca road	6,200	.....	6,200
Sabanas road	16,870	1,145	18,015
Calidonia road	.....	1,972	1,972
Tivoli road	.....	2,700	2,700
Section road	.....	1,225	1,225
Garbage road	.....	1,183	1,183
Ancon road	.....	3,530	3,530
Cemetery road	.....	7,920	7,920
Murphys road	.....	635	635
Tuberculosis Ward road	.....	873	873
Governor's road	.....	1,300	1,300
Gobler's Knob road	.....	125	125
Total	23,070	23,733	46,803

ANCON WATERWORKS.

At the commencement of the fiscal year the new system was practically complete throughout the grounds, water being supplied temporarily from the old French pumping plant. During the year a pumping system has been installed. This consists of two 8½ by 10 by 12 duplex pumps, supplying a 50,000-gallon elevated steel tank on Ancon Hill, and a boiler plant consisting of two 125-horsepower boilers. From this boiler plant, which is located near the railroad, steam is led to the Tivoli Hotel, the Ancon laundry, Ancon Hospital, and the pumps. The tank to which these pumps operate has an elevation above sea level of 265 feet. This is known as the "high-service system of Ancon." It is by-passed by one valve into the low-service system, serving Ancon section and Tivoli, so in case of fire the pressure of the lower system can be increased by about 100 pounds, thus furnishing ample fire protection to the sections in question.

During the year there has also been installed, and will be in operation during the early part of July, a filtration plant, filtering water through sand beds under pressure. It has a capacity of 1,500,000 gallons per twenty-four hours, and will furnish filtered water to Panama, Ancon, Tivoli Section, and La Boca.

The following table shows the condition of the Ancon waterworks:

	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
Cast-iron water pipe:			
4-inch [a] linear feet	.....	535	535
4-inch do	1,698	5,120	6,818
6-inch do	5,281	5,005	10,286
8-inch do	1,774	128	1,902
20-inch [b] do	2,000	.....	2,000
	10,753	10,788	21,541
Wrought-iron water pipe:			
1¼-inch do	.....	330	330
2-inch do	.....	460	460
2½-inch do	.....	235	235
3-inch do	.....	1,300	1,300
3½-inch do	.....	4,570	4,570
4-inch do	.....	264	264

[redacted]

NORTH AVENUE AT MARKET, PANAMA, BEFORE PAVING, JANUARY, 1907.

NORTH AVENUE AT MARKET, PANAMA, AFTER PAVING, AUGUST, 1907.

PLATE 48.

NORTH AVENUE AT MARKET, PANAMA, AFTER PAVING, AUGUST, 1907.

CATHEDRAL PLAZA, PANAMA, BEFORE PAVING, MARCH, 1906.

CATHEDRAL PLAZA, PANAMA, AFTER PAVING, AUGUST, 1907.

TWELFTH STREET, PANAMA, BEFORE PAVING, FEBRUARY, 1907.

TWELFTH STREET, PANAMA, AFTER PAVING, AUGUST, 1907.

NORTH AVENUE, PANAMA, BEFORE PAVING, JUNE, 1907.

NORTH AVENUE, PANAMA, AFTER PAVING, AUGUST, 1907.

FOURTH STREET, COLON, BEFORE PAVING, OCTOBER, 1906.

FOURTH STREET, COLON, AFTER PAVING. AUGUST, 1907.

SECOND STREET, COLON, BEFORE PAVING, OCTOBER, 1906.

SECOND STREET, COLON, AFTER PAVING, AUGUST, 1907.

EIGHTH AND FRONT STREETS, COLON, BEFORE PAVING, SEPTEMBER, 1906.

EIGHTH AND FRONT STREETS, COLON, AFTER PAVING, OCTOBER 1906.

ON THE ROAD BETWEEN LA BOCA AND PANAMA.

TENTH AND BOLIVAR STREETS, COLON, BEFORE PAVING, OCTOBER, 1906.

TENTH AND BOLIVAR STREETS, COLON, AFTER PAVING, AUGUST, 1907.

BOTTLE ALLEY, COLON, BEFORE PAVING, SEPTEMBER, 1906.

BOTTLE ALLEY, COLON, AFTER PAVING, JUNE, 1907.

CASH ALLEY, COLON, BEFORE PAVING, SEPTEMBER, 1906.

CASH ALLEY, COLON, AFTER PAVING, AUGUST, 1907.

TENTH STREET FROM D STREET, COLON, BEFORE PAVING, SEPTEMBER, 1906.

TENTH STREET FROM D STREET, COLON, AFTER PAVING, AUGUST, 1907.

ROAD MAKING AT ANCON BEFORE COMPLETION.

ROAD MAKING AT ANCON, AFTER COMPLETION.

CRISTOBAL, BEFORE PAVING, JANUARY, 1907.

CRISTOBAL, AFTER PAVING, AUGUST, 1907.

FIRE DRILL, FRONT STREET, COLON.

ANCON SEWERAGE SYSTEM.

During the year the sewers have been extended as required to Tivoli Hill, Gobler's Knob; also to labor camps in the vicinity of Ancon. The following table shows details:

	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
Vitrified pipe:			
4-inch.....linear feet..	1,031	104	1,135
6-inch.....do....	6,025	5,540	11,565
8-inch.....do....	1,331	4,612	5,943
12-inch.....do....	.....	39	39
	8,387	10,295	18,682
House connections.....	40	52	92
Concrete manholes:			
4-foot diameter.....	29	.....	29
3-foot diameter.....	.....	33	33

LA BOCA.

The water and sewer system at La Boca was extended to meet growing demands during the fiscal year, as follows:

	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
Cast-iron pipe:			
3-inch.....linear feet..	1,442	50	1,492
6-inch.....do....	12,543	555	13,098
	13,985	605	14,590
Wrought-iron pipe:			
1-inch.....do....	.....	240	240
1¼-inch.....do....	.....	390	390
2½-inch.....do....	.....	493	493
3-inch.....do....	354	584	938
4-inch.....do....	267	401	668
6-inch.....do....	.....	1,116	1,116
	621	3,234	3,855
House connections.....	36	6	42
Hydrants.....	10	.....	10
Hose valves.....	9	45	54
SEWERS.			
Vitrified pipe:			
4-inch.....linear feet..	1,387	165	1,552
6-inch.....do....	1,372	15	1,387
8-inch.....do....	704	.....	704
	3,463	180	3,643
House connections.....	37	2	39
Concrete manholes 3½-foot...	9	.....	9

COROZAL.

The water system at this point was extended during the fiscal year to meet the growing conditions of this camp.

A sewer system was installed in the labor camp at East Corozal, carrying the sewage into the adjoining swamp.

The following table shows in detail the conditions as of the close of the fiscal year:

	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
Cast-iron pipe:			
3-inch.....linear feet..	**540**	.....	**540**
4-inch.....do.....	**1,500**	.....	**1,500**
6-inch.....do.....	945	.....	945
	2,985	.....	2,985
Wrought-iron pipe:			
1½-inch.....do.....	.....	758	758
2-inch.....do.....	.....	72	72
2½-inch.....do.....	145	.....	145
3-inch.....do.....	150	16	166
3½-inch.....do.....	.....	800	800
	295	1,646	1,941
House connections.....	19	10	29
Hydrants.....	3	.....	3
Hose valves.....	20	3	23
SEWERS.			
Vitrified pipe:			
4-inch.....linear feet..	791	.....	791
6-inch.....do.....	1,579	1,712	3,291
8-inch.....do.....	1,648	.....	1,648
	4,018	1,712	5,730
Cast-iron pipe:			
6-inch.....do.....	24	32	56
8-inch.....do.....	24	.....	24
	48	32	80
House connections.....	19	6	25
Brick manholes, 3½ by 2½.....	15	.....	15
Concrete manholes, 4 feet diameter.....	2	.....	2
Concrete manholes, 3½ feet diameter.....	.....	8	8

PEDRO MIGUEL.

At the commencement of the fiscal year waterworks and sewer system were complete. The former consisted of old French 3-inch cast-iron pipe which had been taken up and relaid. Owing to town extension, a 4-inch line was laid and a new system installed. Details of the work done are as follows:

	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
Cast-iron pipe:			
2½-inch.....linear feet..	60	32	92
3-inch.....do....	1,464	.....	1,464
4-inch.....do....	.....	1,637	1,637
6-inch.....do....	180	166	346
	1,704	1,835	3,539
Wrought-iron pipe:			
1½-inch.....do....	.....	1,067	1,067
2-inch.....do....	.....	216	216
	.....	1,283	1,283
House connections.....	21	35	56
Hydrants.....	.....	1	1
Hose valves.....	6	8	14
SEWERS.			
Vitrified pipe:			
4-inch.....linear feet..	945	20	965
6-inch.....do....	2,198	3,398	5,596
8-inch.....do....	1,732	1,252	2,984
	4,875	4,670	9,545
Cast-iron pipe:			
6-inch.....do....	24	56	80
8-inch.....do....	.....	92	92
	24	148	172
House connections.....	21	33	54
Concrete manholes:			
4 feet diameter.....	20	.....	20
3½ feet diameter.....	.....	15	15

About 500 feet of road near the old station has been graded.

PEDRO MIGUEL CRUSHER.

The crusher in operation at the commencement of the fiscal year was continued until November 26, 1906, when it was dismantled and shipped to Rio Grande Superior, where it was installed and is now operated. Previous to its removal and during the fiscal year it crushed 13,362 cubic yards.

PARAISO.

On account of the low pressure obtainable from the present gravity system in the upper part of the town, a 15,000-gallon tank was placed at elevation 240, to be supplied by a pump located in the machine shops and operated by the mechanical department. The following is a summary of the work done:

	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
Cast-iron pipe:			
4-inch.....linear feet..	2,023	1,618	3,641
6-inch.....do....	3,427	1,680	5,107
	5,450	3,298	8,748
Wrought-iron pipe:			
1½-inch.....do....	.....	252	252
2-inch.....do....	.....	408	408
2½-inch.....do....	.....	957	957
3-inch.....do....	.....	56	56
6-inch.....do....	.....	235	235
	.....	1,908	1,908
House connections.....	25	36	61
Hydrants.....	.....	10	10
Hose valves.....	.....	4	4
SEWERS.			
Vitrified pipe:			
4-inch.....linear feet..	15	205	220
6-inch.....do....	192	4,775	4,967
8-inch.....do....	1,175	3,029	4,204
12-inch.....do....	.....	396	396
	1,382	8,405	9,787
Galvanized-iron pipe, 8-inch.....do....	.....	12	12
House connections.....	4	54	58
Concrete manholes, 3½ feet diameter.....	3	33	36

CUCARACHA.

This camp was formerly connected by 2-inch wrought-iron line across the canal. In order to furnish better supply, a 4-inch wrought-iron line has been extended from the Paraiso system. A sewer system has been authorized, but no pipe laid as yet. The following table shows the work accomplished during the year:

	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total July 1, 1907.
Wrought-iron pipe:			
1½-inch.....linear feet..	.....	428	428

The capacity of the reservoir between these two elevations is 248,230,000 gallons. The inflow to the reservoir in excess of evaporation and leakage during the period of 149 days was therefore 51,361,000 gallons. This reservoir is connected with Panama and all points south of Rio Grande by a 16-inch main, which supplies all points between Rio Grande and the Pacific Ocean. In addition, by pumps located at Cucaracha, the towns of Rio Grande and Culebra and a part of the Culebra division are supplied with water from the Rio Grande source. There was also installed in the city of Panama a Venturi meter to measure all water passing into that city. This meter indicated a total consumption of 198,412,000 gallons for a period of 272 days, an average daily consumption by the city of Panama (and upon which revenue is collected) of approximately 729,000 gallons. The difference, 1,319,783 gallons per day, was used within the Zone for canal purposes. Two million forty-eight thousand seven hundred and eighty-three gallons is the estimated daily outflow from October 2, 1906, the date of the installation of the meter in Panama, to June 30, 1907. Rio Grande reservoir was highest December 4, 1906, when the water reached a point 3 feet 6 inches above the spillway. It was lowest on June 10, 1907. The new work carried on during the year at the reservoir, in addition to its maintenance and the installation of a Venturi meter, consisted of strengthening the dam by the completion of two masonry piers and completing the spillway. During the coming year it is intended to place flashboards in the spillway at the end of the rainy season, and thereby increase the storing capacity approximately 75,000,000 gallons.

A drainage ditch 3,260 feet long has also been built alongside the Panama Railroad to prevent the pollution of the reservoir.

On June 1, owing to the extremely prolonged dry season, it became necessary to install temporary pumps upon a float in the reservoir for the purpose of pumping water into the screen chamber at an elevation higher than could be had from the reservoir by gravity. This was necessary, not on account of the shortage of water, but because the pumps at Cucaracha have a suction lift limited to elevation 216. When the reservoir drops below this point these pumps would not operate. On June 19, the reservoir having risen, it was unnecessary to operate the pumps on float any longer.

RIO GRANDE STONE CRUSHER.

At the end of the year 1906 it became necessary to abandon the stone crushers erected by this division at Pedro Miguel on account of the site being required for active operations of the Culebra division, excavation department. After an examination of the ground at various points for good rock it was determined to place the crusher plant at Rio Grande. This was started in the early part of July, 1906. The first installation consisted of two French jaw crushers that had been used at Pedro Miguel. Later on the demand for stone became so much greater that a No. 5 crusher was installed. The demand speedily increased until it became necessary to install a second crusher, No. 5; thus, this plant at the present time consists of four crushers. The total output during the year was 49,512 cubic yards. At the present time the output averages 10,000 cubic yards per month. At the beginning this quarry required a considerable amount of work for stripping, but as it was one of the few points on the Isthmus, and especially because it was located at the summit of grade of Panama Railroad,

as the supply of trap rock of the best quality was practically inexhaustible, it was decided to develop this quarry, which would furnish trap rock at any needed rate during the construction of the canal.

CULEBRA DISTRICT WATER SUPPLY (CULEBRA, ENTERPRISE, AND RIO GRANDE.)

Owing to increased demand on the water supply at Culebra, it became necessary to increase the pumping capacity of the Cucaracha pumps, from which these points are supplied. Formerly there had been one 8½ by 10 by 12 duplex pump. This was replaced by two 10 by 14 by 16 old pumps on hand and which were overhauled. The average amount of water pumped daily by these pumps is 350,000 gallons. The boiler plant installed consists of two locomotive-type boilers of 125 horsepower. These pumps take water by suction from the main leading from Rio Grande to Panama and lift it to the top of the hill at Enterprise, from which point it flows by gravity to the lower surface of Culebra. There was installed for the high service of Culebra during the year a station pumping to the Mount Zion reservoir, the elevation of which is 545 feet, which has a capacity of 535,000 gallons and furnishes the water supply and fire protection to the higher parts of Culebra Hill. This plant consists of three upright boilers and one duplex pump 8½ by 10 by 12. A second pump is now being installed. The Mount Zion pumping station pumps daily approximately 160,000 gallons. At the time of installing this pumping station a distilling plant was also put in operation at the pump house. From this plant distilled water is furnished for Culebra and Rio Grande, the daily consumption being 1,200 gallons. During the year there has been completed in the Culebra district the following new construction work:

	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
Cast-iron pipe:[a]			
2-inch.....linear feet..	3,285	.....	3,285
3-inch.....do....	3,865	.....	3,865
4-inch.....do....	6,507	2,210	8,717
6-inch.....do....	11,004	1,311	12,315
8-inch.....do....	490	1,074	1,564
	25,151	4,595	29,746

[redacted]

CAMACHO RESERVOIR.

This reservoir has been built for the purpose of supplying Empire, Culebra, and Las Cascadas with water. It is built upon the Camacho Creek at a point about a mile south of Empire. The dam has a crest elevation of 365 feet above tide level. The reservoir area is 38 acres and the drainage area 592 acres. The capacity available for consumption is 258,000,000 gallons. The dam consists of a reenforced concrete core wall extending from hill to hill, heavily backed on both sides with clay fill. The wasteweir for dam is carried through the hills to the right or east of the dam. This wasteweir is 60 feet in width. The total height of the dam is 70 feet. The construction of the dam was started during the fiscal year ending June 30, 1906. The system of mains leading from the dam to Culebra, Empire, and Las Cascadas has been completed, and at the end of the present rainy season this dam will be in full operation thereby eliminating, to a large extent, the pumping now required at Cucaracha, Empire, and Las Cascadas. The following table shows the material used in the dam:

Kind of work.	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
Earth fill.....cubic yards..	34,000	22,000	56,000
Concrete core wall.....do....	612	1,102	1,712
Waste way.....do....	358	.....	358
In spillway.....do....	.....	887	887
In screen chamber.....do....	109	310	419
Earth excavation, spillway.....do....	.....	9,595	9,595
16-inch cast-iron pipe.....linear feet..	363	.....	363
Riprapping face.....square feet..	.....	28,000	28,000

CAMACHO DISTRIBUTION SYSTEM.

Kind of work.	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
Cast-iron pipe:			
4-inch.....linear feet..	910	516	1,426
6-inch.....do....	330	372	702
8-inch.....do....	3,130	960	4,090
10-inch.....do....	3,420	2,244	5,664
12-inch.....do....	8,430	4,034	12,464
16-inch.....do....	2,570	2,004	4,574
	18,790	10,130	28,920
Galvanized-iron pipe, 20-inch.....do....	970	1,035	2,005

NOTE.—Of the above, 970 feet 20-inch galvanized-iron pipe and 2 820 feet 12-inch cast-iron pipe was relaid; 1,320 feet 8-inch cast-iron pipe was laid at Bas Obispo; 1,025 feet of the 20-inch galvanized-iron pipe was laid in concrete and it, together with the 16-inch cast-iron pipe, was supported on concrete piers where necessary to keep the grades. This work required 271 cubic yards of concrete.

The following table shows work completed at Empire and Camacho during the year:

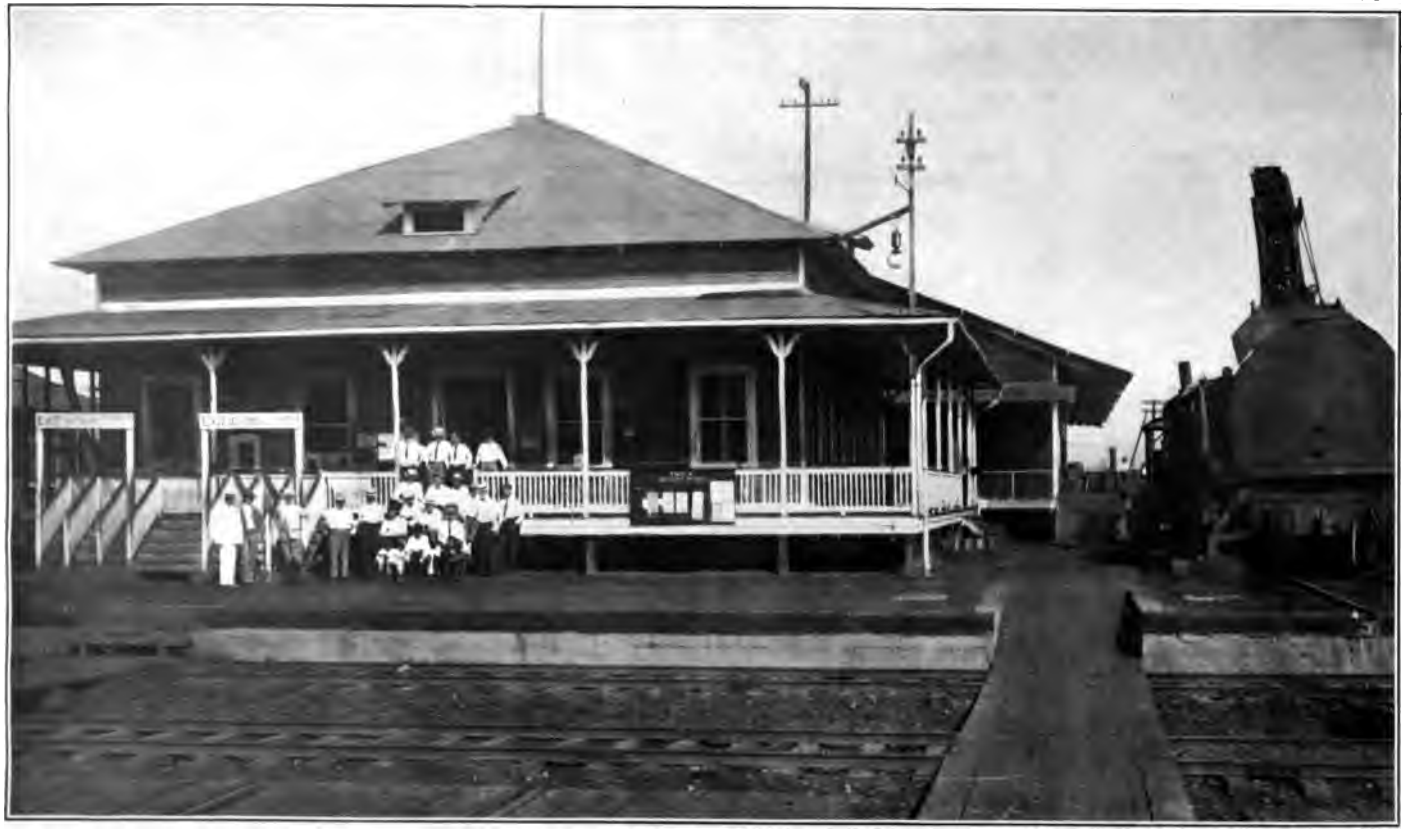
Kind of work.	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
Cast-iron pipe:			
2-inch.....linear feet..	800	.....	800
3-inch.....do....	300	.....	300
4-inch.....do....	1,100	1,206	2,306
6-inch.....do....	.....	4,738	4,738
	2,200	5,944	8,144
Galvanized-iron pipe:			
2-inch.....do....	.....	800	800
3-inch.....do....	.....	878	878
4-inch.....do....	.....	1,865	1,865
	.....	3,543	3,543
Standpipes.....	.....	22	22
Fire hydrants.....	.....	10	10
House connections.....	64	71	135
SEWERS.			
Empire:			
Sewer pipe --			
4-inch.....linear feet..	2,048	.....	2,048
6-inch.....do....	3,030	5,461	8,491
8-inch.....do....	2,740	5,042	7,782
	7,818	10,503	18,321
Steel spiral, 8-inch.....do....	.....	60	60
Vitrified pipe, 12-inch.....do....	.....	137	137
Camacho:			
Sewer pipe			
6-inch.....do....	.....	2,637	2,637
8-inch.....do....	.....	5,754	5,754
Spiral pipe, 8-inch.....do....	.....	134	134
	.....	8,525	8,525
ROADS.			
Empire: Macadam road.....linear feet..	.....	1,386	1,386
Camacho: Macadam road.....do....	2,620	2,560	5,180

LAS CASCADAS.

At the beginning of the year the temporary system installed by the Panama Railroad was abandoned as insufficient for the growing

GENERAL VIEW OF GORGONA SHOPS.

TRANSFER TABLE AND PIT, GORGONA SHOPS.



OFFICE BUILDING, GORGONA SHOPS.

YARDS AT GORGONA SHOPS.

CHAGRESITO.

A 3-inch line was connected to this camp with Bas Obispo supply during the year. The sewer connects with baths, water-closets, kitchens, and hospitals, and the outfall is in the Chagres River.

SANTA CRUZ.

Water was supplied to this camp in March, 1907. A 2½-inch line was laid across the Chagres to the main at Matachin from the Gorgona system which ended near the old railroad station. A sewer line has been located and approved, but the pipe has not yet been received.

GORGONA MACHINE SHOPS.

A complete inside fire system has been authorized and installed in the car shops, planing mill, erecting shed, storehouse, and machine shop. A complete system of sewers for the shops has been built.

GORGONA.

Owing to increased demand on water supply, the storage capacity of the Carabali dam has been increased from forty millions to eighty-five millions by raising the dam 10 feet.

A condensing plant has been in operation for the past eight months in connection with the pumping station.

A sewer line to the new town is now under construction.

CABALLA VIEJO.

Water is supplied to this camp from Gorgona, and sewers have been installed discharging into the Chagres.

JUAN GRANDE.

Water is supplied to this camp from Gorgona.

MAMEI.

Water is supplied from Gorgona system. Work on sewers has not yet been started.

SAN PABLO.

A rain-water tank has been erected for use of engineering department.

TABERNILLA.

A complete new system of water has been installed with the exception of the pumping station and the lines from the pumps to the tank. A fire protection system has also been installed. A 2½-inch line runs to Camp La Voi, about a mile north of town.

The sewer system has been completed with the exception of a short line to the new camp on the west side of the railroad track.

GATUN.

A 6-inch cast-iron pipe line has been laid from the new town site to the site of the proposed pumping station on Gatuncillo River. A 5-inch galvanized-iron main has been laid through the entire town connecting all white quarters. A fire protection system has been installed. A permanent distilling plant was erected near the 50,000-gallon tank. A complete sewer system has been laid out and authorized. *Foundations* were laid for the erection of a 400,000-gallon tank.

BAS OBISPO CRUSHER.

During the operation of this crusher by this division from October 1, 1906, to January 15, 1907, the output was increased from 105 cubic yards per day to over 800 cubic yards. On the latter date the crusher was turned over to the Culebra division.

Character of material.	Size.	Town.	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total, July 1, 1907.
			Linear ft.	*Linear ft.*	*Linear ft.*
Water pipe	2-inch	Las Cascadas and White House.		3,850	3,850
Do	3-inch	do		430	430
Do	4-inch	do		1,360	1,360
Do	6-inch	do		2,025	2,025
				7,665	7,665
Do	2-inch	Bas Obispo, etc	2,596		2,596
Do	6-inch	do	770		770
			3,366		3,366
Do	4, 6, and 8 inch	Gorgona	17,770		17,770
Do	2½-inch	do		1,190	1,190
Do	¾-inch	do		2,100	2,100
Do	3-inch	do		1,400	1,400
Do	4-inch	do		8,240	8,240
Do	6-inch	do		1,465	1,465
Do	8-inch	do		750	750
			17,770	15,145	32,915
Do	¾-inch	Tabernilla		600	600
Do	2-inch	do		1,680	1,680
Do	3-inch	do		6,383	6,383
Do	5-inch	do		1,325	1,325
				9,988	9,988
Do	¾-inch	Gatun		2,000	2,000
Do	1-inch	do		500	500
Do	2½-inch	do		2,000	2,000
Do	5-inch	do		3,575	3,575
Do	6-inch	do		5,750	5,750
				13,825	13,825
Do	2½-inch	Matachin		4,400	4,400
Sewer pipe	6-inch	Las Cascadas and White House.		6,005	6,005
Do	8-inch	do		550	550

Character of material.	Size.	Town.	Prior to July 1, 1906.	July 1, 1906, to July 1, 1907.	Total July 1, 1907.
			Number.	*Number.*	*Number.*
House connections		Las Cascadas	10	160	170
Do		Buena Vista	3	45	48
Do		Bas Obispo	64	20	84
Do		Camp Elliott	36	.....	36
Do		Gamboa	10	22	32
Do		Chagresito	11	19	30
Do		Haut Obispo	.....	25	25
Do		Santa Cruz	.....	102	102
Do		Matachin	.....	36	36
Do		Gorgona	92	106	198
Do		Jamaicatown	17	49	66
Do		Caballa Viejo	12	12	24
Do		Juan Grande	.....	11	11
Do		Tabernilla	14	90	104
Do		Gatun	.....	137	137
			269	834	1,103
Hose connections		Las Cascadas	.....	40	40
Do		Santa Cruz	.....	6	6
Do		Gorgona	.....	13	13
Do		Tabernilla	.....	23	23
Do		Gatun	.....	27	27
Water faucets		Las Cascadas	.....	24	24
Do		Bas Obispo	.....	2	2
Do		Chagresito	.....	9	9
Do		Matachin	.....	2	2
Do		Santa Cruz	.....	12	12
Do		Tabernilla	.....	17	17
Fire hydrants		Matachin	.....	2	2
Do		Gorgona	.....	22	22
Tanks	50M	Las Cascadas	.....	1	1
Do	8 by 14	.....do	1	1	2
Do	8 by 15	.....do	.....	1	1
Do	8 by 8	.....do	.....	2	2
			1	5	6
Do	8 by 8	Bas Obispo	11	.....	11
Do	50M	.....do	1	.....	1
			12	.....	12
Do	50M	Matachin	.....	1	1
Do	8 by 8	Gorgona	.....	2	2
Do	8 by 13	Tabernilla	1	.....	1
Do	8 by 16	.....do	1	.....	1
			2	.....	2
Do	8 by 8	Gatun	.....	4	4
Do	50M	.....do	.....	1	1
			.....	5	5
Water column		Las Cascadas	.....	1	1
Do		Bas Obispo	.....	1	1
Do		Gorgona	.....	4	4
Standpipes		Gatun	.....	2	2

ROADS.

During the fiscal year 3,130 linear feet of road have been built in Las Cascadas and White House district, 3,886 in Bas Obispo, 7,600 in Gorgona, and 9,200 in Gatun district.

BRAZOS BROOK WATER SUPPLY.

This supply furnished Cristobal and Colon. From January 25 to May 25, 1907, Mindi diversion also furnished water. The reservoir was completed in December, 1906. The following table shows the amount of material handled:

	Prior to July 1, 1906	July 1, 1906, to July 1, 1907.	Total July 1, 1907.
	Cubic yards.	*Cubic yards.*	*Cubic yards.*
lo. 1	42,200	19,725	61,925
lo. 2	20,300	13,459	33,759
lo. 3	13,500	8,483	21,983
Total	76,000	41,667	117,667

ıe area of the reservoir as completed is 122 acres. The area of the rshed is 638 acres. High-water elevation is 45.1. At this ele- the capacity of the reservoir is 435,000,000 gallons. On July 1907, the elevation was 38.2, with a capacity of 115,691,000 ns.

ıe rainfall at Brazos during the year was:

1906.	Inches.	1907.	Inches
	20.82	January	2.06
st	16.25	February	.91
mber	14.61	March	1.97
er	16.40	April	1.07
mber	23.66	May	6.82
mber	16.17	June	14.81
	107.91		27.64

Total rainfall, 135.55 inches.

ı February 23, 1907, 800 pounds of copper sulphate were dis- ıted in the reservoir in order to kill the vegetable growth. In days the growth had disappeared.

MOUNT HOPE PUMPING STATION.

ıring the year two pumps and two 80-horsepower boilers were ılled

MOUNT HOPE FILTRATION PLANT.

ltration plant similar to that installed at Ancon and described in on devoted to that place in this report was installed at Mount

CRISTOBAL WATER SERVICE.

Connections were made to dock 11, ice plant, bakery, and laundry. Four-inch connections were made to supply clapets with water. Forty-two house connections were put in and 26 fire hydrants installed.

CRISTOBAL AUXILIARY WATER SUPPLY.

The old 4-inch line of the Panama Railroad was torn up and 6-inch main laid from Mindi pumping station to the dry dock and to the Cristobal machine shops. This 6-inch main is 8,500 feet in length.

CRISTOBAL SEWERAGE SYSTEM.

Sewers were constructed in Camp Bierd and to the machine shops and Cristobal market, requiring the following material:

	Linear feet.		Linear feet.
6-inch vitrified pipe	2,477	15-inch vitrified pipe	1,348
8-inch vitrified pipe	459	20-inch vitrified pipe	327
10-inch vitrified pipe	311	10-inch cast-iron pipe	207

CRISTOBAL ROADS.

The amount of road work completed to date in Cristobal has required:

Grading	cubic yards	6,952
Earth fill	do	3,200
Macadam spread	square yards	23,463
Concrete curb and gutter	linear feet	20,187
Open drains	do	900
Catch basins		12

MOUNT HOPE ROAD.

This road connects Cristobal with Mount Hope. To date 80 per cent of the work has been completed.

FIRE PROTECTION.

At the time of the last annual report 87 fire plugs were in use. Since that time 27 have been installed, and the following table shows how they all are distributed:

Colon	42
Beach road	13
Colon Hospital	10
Wireless and quarantine	6
Canal Zone:	
Dry dock	9
Mount Hope	8
Cristobal	26
Total	114

An auxiliary fire-protection system has been laid as follows.

Mount Hope storehouse.—A 6-inch lateral was laid from the 20-inch main and twenty-four 2½-inch hose connections made.

Dry dock.—Two 2½-inch connections, made from 6-inch lateral.

Dock 14.—Six-inch lateral supplies, fifteen 2½-inch connections.

Dock 11.—Fourteen 2½-inch connections were installed. In vicinity of ice plant a fire cistern or sump was constructed well below sea level and connected with the bay by a 16-inch pipe for use in case of emergency.

Commissary.—Twelve 2½-inch connections were installed.

Medical store, Colon Hospital.—Twelve 2½-inch hose connections.

Fire pier.—This pier extends about 25 feet over the water at the northern end of Roosevelt avenue, Cristobal, and a 6-inch suction pipe with 4-inch reducer is attached. Fire engine can be run out on this pier in case of emergency.

WATER SERVICE INSPECTION

An inspector locates and reports leaks and inspects all plants and buildings connected with the water supply at least twice a week.

LABOR CONDITIONS.

The labor supply has been ample to meet the demands at all times. The superiority of the European laborer over the West Indian laborer has been very apparent. There is given herewith a statement showing the average number of employees during the present fiscal year.

	Daily average.	
	Silver.	Gold and silver.
1906.		
July	1,466	2,284
August	2,206	2,371
September	2,205	2,359
October	2,000	2,150
November	2,054	2,210
December	2,323	2,473
1907.		
January	2,682	2,815
February	3,090	2,204
March	2,971	2,859
April	2,889	3,067
May	2,507	2,667
June	2,168	2,320

[redacted]

Statement of expenditures for the fiscal year ending June 30, 1907, for the division of municipal engineering.

Work.	Material.	Labor cost.	Supervision, etc.	Total.
Panama waterworks and sewers	$47,834.21	$39,616.88	$14,003.20	$101,454.29
Ancon and Tivoli water supply and sewers	30,904.05	21,181.46	11,154.80	63,240.31
La Boca water supply and sewers	1,842.08	1,461.99	766.67	4,070.74
Taboga water supply and sewers	1,126.15	954.19	717.33	2,797.67
Corozal, Pedro Miguel, and Paraiso water supply and sewers	16,470.48	13,337.14	6,511.88	36,319.50
Culebra water supply and sewers	17,133.68	20,066.23	10,967.54	48,767.45
Empire and Comacho waterworks and sewers	48,086.48	91,577.23	33,946.87	173,610.58
Las Cascadas water supply and sewers	18,037.20	18,228.22	4,894.92	41,160.34
Bas Obispo water supply and sewers	8,377.47	11,497.48	3,070.87	22,945.82
Gorgona water supply and sewers	26,045.01	27,200.15	10,714.21	63,959.37
Tabernilla water supply and sewers	10,060.05	10,892.88	2,935.48	23,888.41
Gatun water supply and sewers	54,741.24	31,641.31	8,533.36	94,915.91
Cristobal water supply and sewers	13,227.54	13,434.52	4,843.27	31,505.33
Colon waterworks and sewers	65,115.48	89,669.88	39,467.32	194,252.68
Supply pipe line, Panama waterworks	.....	581.18	40.00	621.18
Rio Grande reservoir	.....	1,906.52	846.04	2,752.56
Rio Grande crusher	32,487.64	97,906.73	13,604.36	143,998.73
Pedro Miguel crusher	1,292.42	14,024.14	1,909.14	17,225.85
Bas Obispo crusher	3,230.11	18,346.58	3,668.63	25,245.32
Ancon, Tivoli, La Boca, Santa Rosa, etc., roads	4,544.83	48,066.61	13,498.39	66,109.83
Culebra and Comacho roads	4,417.29	15,546.37	3,297.80	23,261.46
Las Cascadas roads	105.81	1,427.50	315.28	1,848.59
Gatun roads	4,287.02	9,177.11	2,516.12	15,980.25
Bas Obispo and Gorgona roads	188.25	8,557.60	4,060.58	12,806.43
Cristobal and Mount Hope roads	26,547.15	34,359.64	10,413,03	71,319.82
Calidonia and Sabanas roads	1,497.20	11,830.55	1,989.25	15,317.00
Panama paving	29,609.27	74,736.79	18,479.99	122,826.05
Colon paving	197,290.92	62,146.19	17,275.33	276,712.44
Main office	4,548.39	.....	38,491.60	43,039.99
Total	669,047.42	789,973.22	282,933.26	1,741,953.90

DIVISION OF MOTIVE POWER AND MACHINERY.

The mechanical division commenced the fiscal year with old shops at Cristobal, Gorgona, Empire, and Paraiso, engine houses at Lirio and Cucuracha, and air-compressor plants at Rio Grande and Empire.

During the year work was commenced on new shop plants at Empire and Paraiso, the old plants having been continued in service practically as left by the French, wholly inadequate to the demands and impossible of alteration to meet same.

The plant at Empire is especially designed for the maintenance and repair of steam shovels and steel dump cars, and that at Paraiso for light repairs only of practically all of the equipment at the south end of the cut. When completed they will be equipped with modern machinery, which is now being installed. The Empire plant is to be operated by electric motors.

Owing to the opening up of new centers of work and the desirability of being able to take care of the running repairs of rolling stock in close proximity to its work, limited facilities for handling equipment and making running repairs are being provided at Pedro Miguel, Rio Grande (to replace the old Cucuracha engine house), and Tabernilla, and in the near future similar facilities will have to be provided at Gatun and La Boca.

GORGONA SHOPS.

(Until December 24, 1906, these shops were known as Bas Matachin shops.)

Under the French régime they were, as now, the principal shops of the Isthmus. They consist at present of the following buildings:

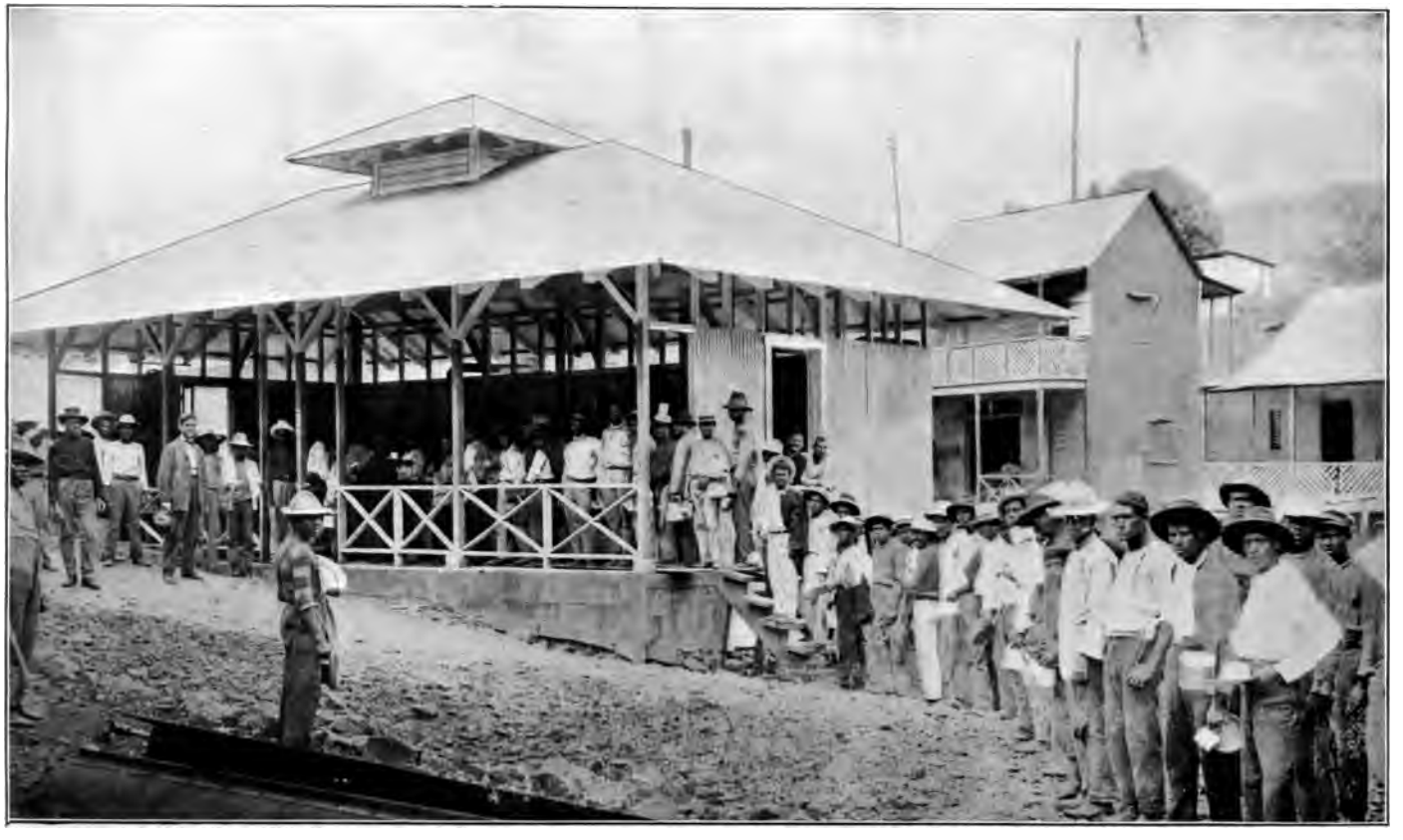
Foundry, 120 by 70 feet, containing 3 cupolas, core ovens, and 6 brass furnaces, with all the necessary machinery and equipment for

YARDS AT GORGONA SHOPS.

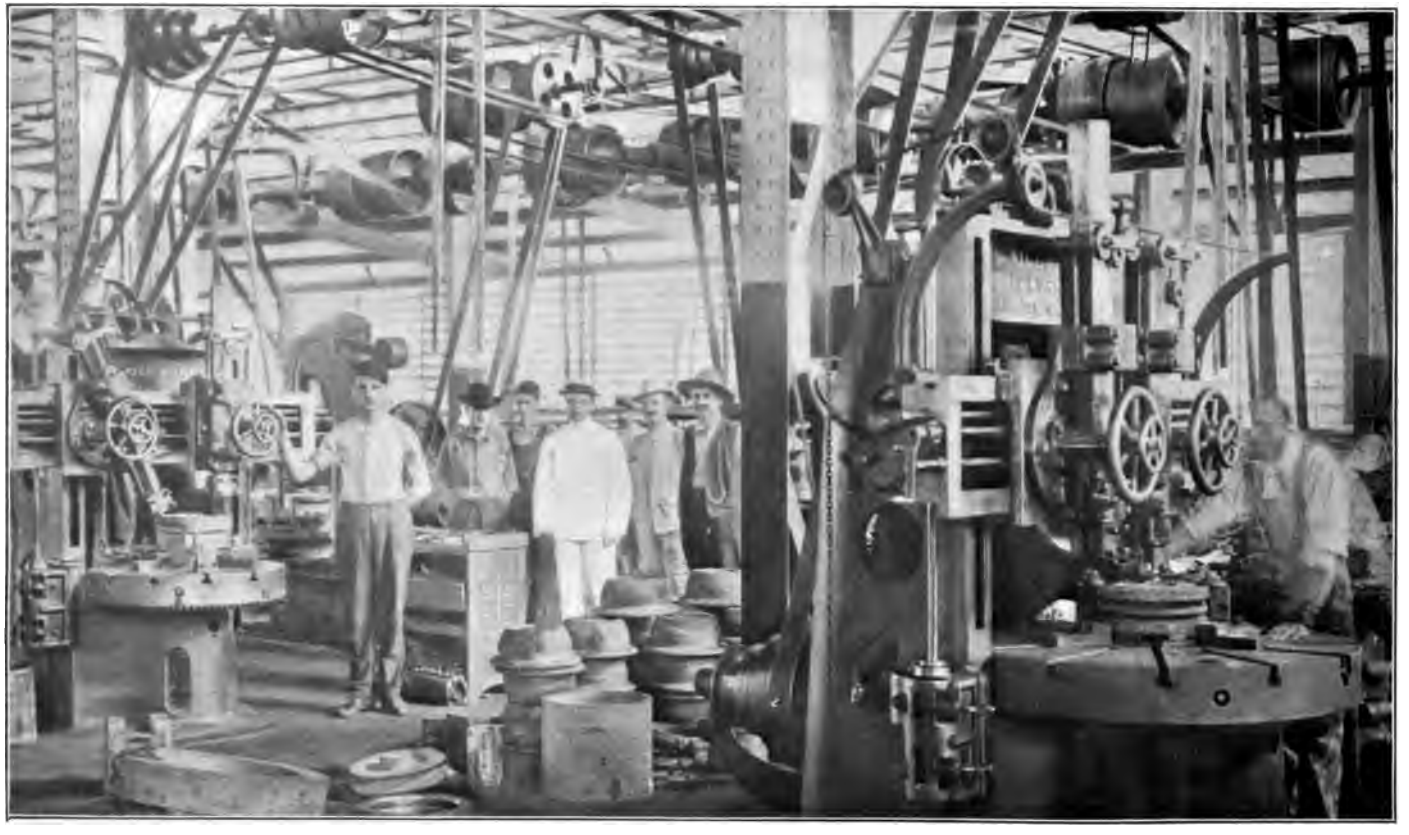
INTERIOR OF PARAISO BOILER SHOPS.

MEALTIME AT AN I. C. C. KITCHEN AT UPPER RIO GRANDE.

MEALTIME AT AN I. C. C. KITCHEN AT LOWER RIO GRANDE.



MEALTIME AT AN I. C. C. KITCHEN AT LOWER RIO GRANDE.



INTERIOR OF GORGONA MACHINE SHOP.

INTERIOR OF GORGONA BLACKSMITHS' SHOP.

INTERIOR OF GORGONA WOOD-WORKERS' SHOP.

ENGINE HOUSE AT LAS CASCADAS.

POWER PLANT AND COAL CHUTE AT LAS CASCADAS.

INTERIOR OF GORGONA WOOD-WORKERS' SHOP.

UNDER ERECTION, LOOKING WEST.

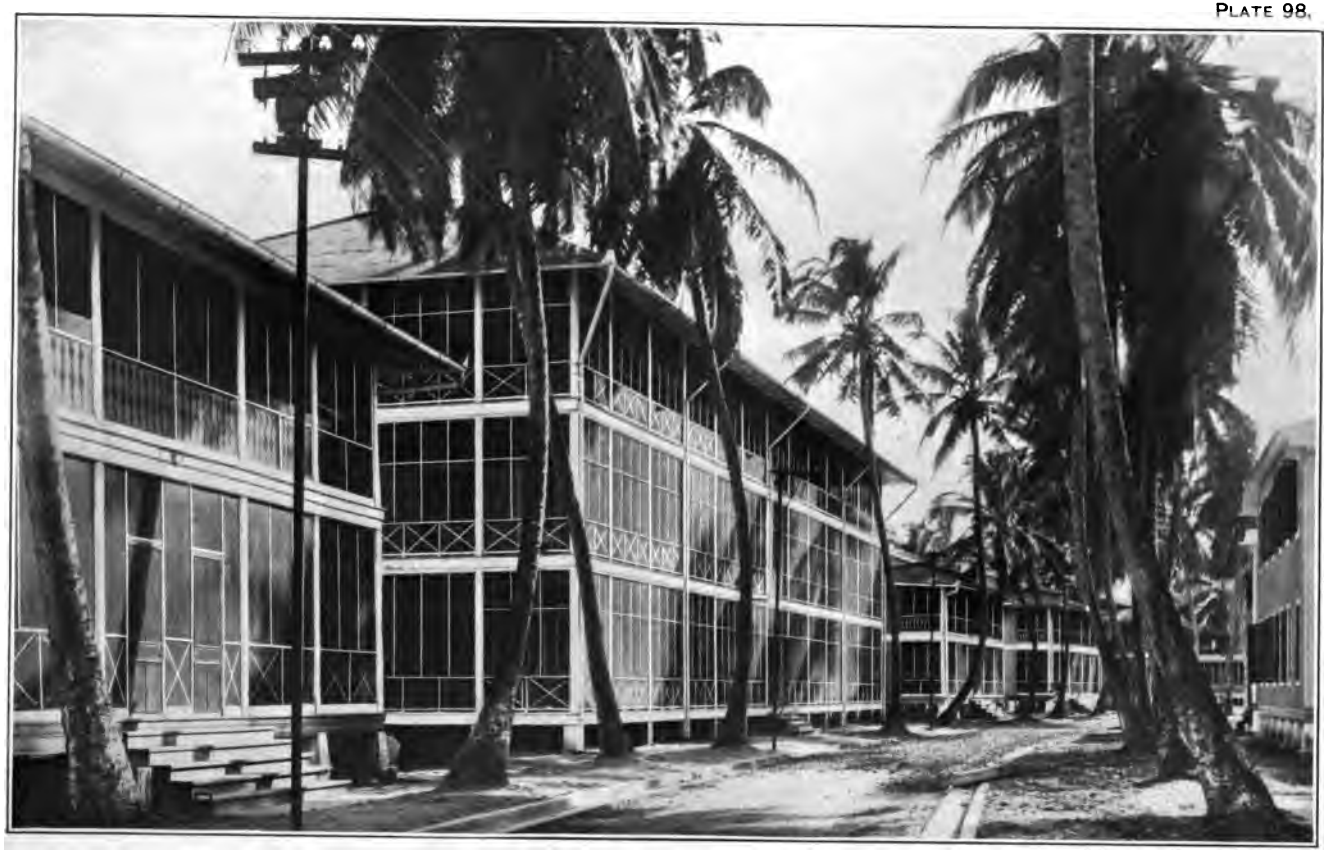
POWER PLANT AND COAL CHUTE AT LAS CASCADAS.

I. C. C. CHAPEL AT ANCON.

ADMINISTRATION BUILDING AT ANCON.

HOTEL TIVOLI, ANCON.

HOTEL TIVOLI, ANCON.

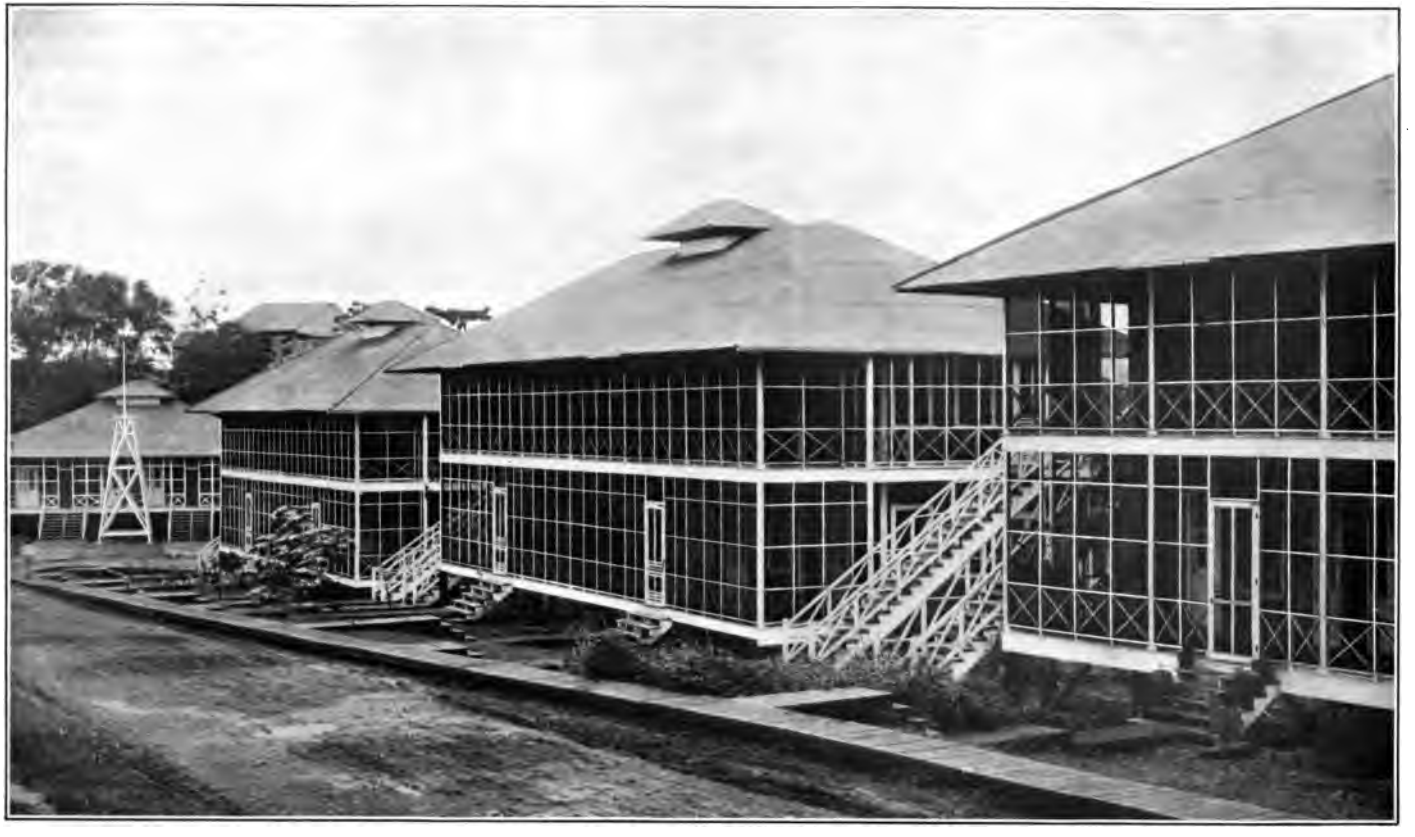


I. C. C. HOTEL AT CRISTOBAL.

DINNER TIME AT A COMMISSION HOTEL AT GORGONA.

DINNER TIME AT A COMMISSION HOTEL AT GORGONA.

DINNER TIME AT A COMMISSION HOTEL AT GORGONA.



TYPE NO. 14, FOUR-FAMILY HOUSE AT CULEBRA. SCHOOLHOUSE IN THE DISTANCE.

DINING ROOM IN FAMILY QUARTERS.

SITTING ROOM IN FAMILY QUARTERS.

Erecting shop, 14 pits, 80 by 362 feet, of ample size to afford clearance for the handling of general repairs of steam shovels.

Transfer pit, 60 by 362 feet, and a 60-foot transfer table, operated by steam.

Car shop, 100 by 405 feet, containing 5 tracks, with a capacity of 40 cars.

Planing mill, 70 by 225 feet.

Lavatories and latrines: The shop is well equipped with lavatory and latrine facilities.

Storehouse, 100 by 300 feet, with 3,700 square feet of platform space additional. This storehouse is under the jurisdiction of the division of material and supplies.

All of these shops to be equipped with the machinery necessary for the work they are designed to handle, which machinery will be operated by a system of electric motors.

Electric-light plant, 86 by 35 feet, containing two 100-kilowatt generators, direct connected to a 160-horsepower tandem compound engine, also a 200 kilowatt generator and engine, now being installed; furnishing, in addition to the power at the shops, current for lighting all quarters and streets at Empire and Culebra, with sufficient reserve capacity for the lighting needed at Las Cascadas roundhouse and Paraiso shops, as well as the various labor camps and settlements between these two points, which are 7 miles apart.

Power plant, 42 by 141 feet, containing a battery of twelve 200-horsepower boilers, to furnish steam for the operation of the air compressor plant (described under the head of these plants) and the electric-light plant.

The shop yards are designed for adequate storage and handling room.

CRISTOBAL SHOPS.

The entire plant at Cristobal was, on November 15, 1906, turned over to the Panama Railroad Company for operation, under lease. It consists of the following:

Machine shop, 91 by 116 feet.

Blacksmith shop, 43 by 118 feet.

Boiler shop, 70 by 116 feet.

Planing mill, 60 by 180 feet.

Power house, 30 by 30 feet, equipped with 4 boilers of 125 horsepower.

Car shop, 100 by 400 feet, through which runs 5 tracks with a capacity of 50 cars.

Office building, 40 by 66 feet.

Roundhouse, 20 stalls for handling locomotives.

Erecting shop, 75 by 200 feet, containing 9 pits.

Transfer pit, 50 by 200 feet, with a 50-foot transfer table, operated by steam.

Between the erecting shop and the transfer pit is a platform 50 feet wide, running the entire length.

Coal chute, on which cars loaded with coal are elevated by steam winch and cable, dumped into 20 pockets for delivery to locomotives. This building also contains appliances for drying and delivering sand to locomotives.

The plant is provided with the necessary cinder pits, storehouses, oil house, etc., and fully equipped with the necessary machinery and tools to handle the mechanical features of the Panama Railroad work. The shops also handle the repairs to marine equipment of the Panama Railroad and Steamship Company.

PARAISO SHOPS.

These shops consist of—

Machine shop, 60 by 160 feet.

Blacksmith and boiler shop, 85 by 160 feet.

Office building, 20 by 50 feet.

Erecting shop, 73 by 150 feet, containing 6 pits of such construction as to be suitable for both locomotive and steam-shovel repairs.

Latrine and lavatory, 30 by 60 feet.

Iron rack, 20 by 60 feet.

Carpenter shop, 32 by 60 feet.

There is also being erected for the division of material and supplies a storehouse 30 by 140 feet, with ample platform space.

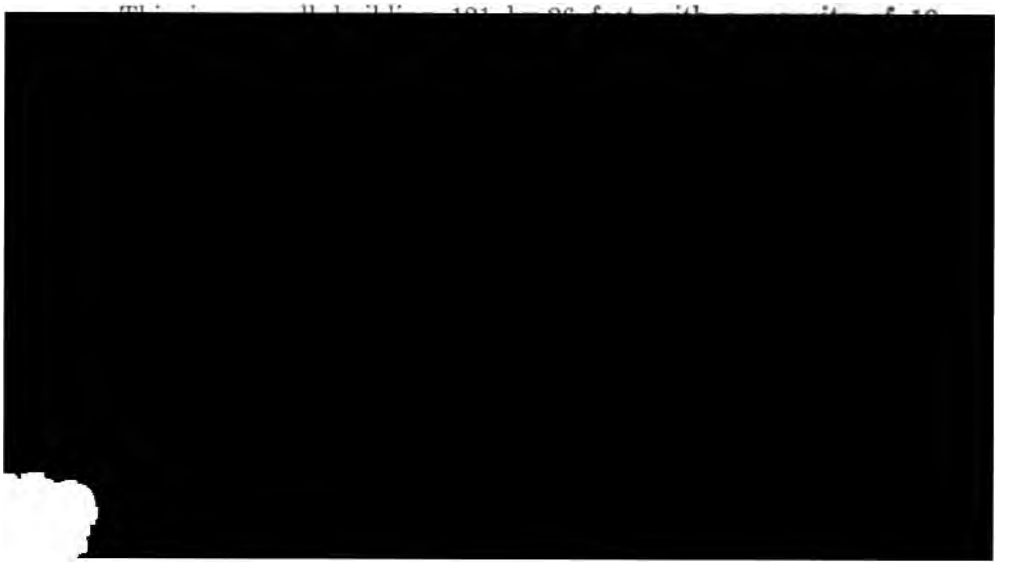
LAS CASCADAS ENGINE HOUSE.

This consists of a rectangular building 90 by 300 feet, containing 5 tracks, with a total capacity of storing 40 engines, with the necessary cinder pits and a small repair shop and machinery to handle the running repairs of the locomotives cared for there.

LAS CASCADAS COAL CHUTE.

At Las Cascadas is located a coal chute, on which cars loaded with coal are elevated on an incline by means of a hoist operated by compressed air from the air pipe line, and dumped into 20 pockets for delivery to locomotives. This building also contains appliances for drying and delivering sand to locomotives.

LIRIO ENGINE HOUSE.



AIR-COMPRESSOR PLANTS.

For the purpose of furnishing compressed air to operate rock drills, stone crushers, etc., there have been constructed three plants, connected by 9½ miles of 10-inch pipe-line mains, extending from Bas Obispo to Pedro Miguel, with 6-inch and 4-inch leads running into the canal prism for the various purposes. These plants contained on June 30 an aggregate of 12 air compressors, each with a capacity of 2,500 cubic feet of air per minute, at 100 pounds pressure, all feeding into the one line. These plants also supply air for operating the coal chutes at Pedro Miguel and Las Cascadas, as well as the necessary use of compressed air at Empire and Paraiso shops.

The organization of the mechanical division on June 30, 1907, consisted of 2;479 men, divided into divisions as follows:

Office of superintendent motive power and machinery	55
Gorgona shops	1,197
Empire shops	628
Paraiso shops	387
Air-compressor plants	91
Electrical subdivision	121
Total	2,479

During the year 1,008 artisans and clerks for this division were sent down from the United States and 637 returned through various causes. The grade of artisans being received for this division has improved during the fiscal year in question. There are fewer unsatisfactory mechanics now being received than has been the case heretofore. During the year the operation of the division has been hampered by the lack of sufficient and properly skilled force.

The completion of the Empire shop plant will necessitate the addition of approximately 250 first-grade skilled mechanics and the necessary helpers for same to properly man the plant.

Statement of the principal items of equipment in service or available on the Isthmus, June 30, 1906, and June 30, 1907.

[All erected and made ready for service by the mechanical division.]

Equipment.	June 30, 1906.	June 30, 1907.
Steam shovels:		
45-ton	1	3
70-ton	15	28
95-ton	23	32
Locomotives:		
French	100	100
New American	39	184
Cars:		
French dump	541	250
American	324	455
American flat (wood)	1,061	1,501
American flat (steel)	500	500
Lidgerwood unloaders	12	18
Bank spreaders	13	13
Unloading plows	22	33
Track shifters	0	3
Pile drivers	1	7

Other miscellaneous work of less importance has also been done.

Work at present under way and for which specifications have been drawn and other preliminary work done is mentioned below:

An additional unit, consisting of one 200-kilowatt, 2,300-volt, 3-phase, alternating current generator, direct connected to a tandem compound, 4-valve Harrisburgh engine, is to be placed in the Culebra-Empire electric-lighting plant.

An additional unit, consisting of one 100-kilowatt, 125–250 volt, 3-wire Westinghouse generator, direct connected to a tandem compound engine, is to be placed in the Gorgona-Matachin electric-lighting plant.

The pole line for the Culebra-Empire plant is to be extended to Las Cascadas and Paraiso, and these towns are to be wired for lights.

An arc-lamp circuit of 16 lamps is to be installed at Culebra.

An arc-lamp circuit of 17 lamps is to be installed at Cristobal.

All Commission hotels are to be equipped with electric fans.

The town of Gatun is to be wired for electric lights, the power for which will be taken from the Panama Railroad Company's plant at Colon.

Electric motors and cranes for Empire shops have been ordered and will soon be installed.

Equipment has been ordered for the electric lighting of the rock-crushing plant at Porto Bello, which is to be operated day and night.

An automatic fire-alarm telegraph system for Commission buildings at Ancon and in the city of Panama is now being ordered.

Specifications were also revised for the construction of a large material-handling plant in connection with the Gatun locks and dams.

BUILDING CONSTRUCTION DIVISION.

During the fiscal year ending June 30, 1907, the organization of the division of building construction was well established, and few changes have been made. A new assistant master builder was appointed in September, 1906, and a supervisor of accounts was added to the organization in February, 1907.

The average force employed during the year has been 3,570 men, the maximum force being 4,168 men employed in March, 1907, and

two or more families. Some new types were designed for residences of officials.

Two hundred and fifty-six quarters for gold employees were constructed, consisting of residences of various types, both bachelor and family quarters.

Quarters were constructed for the accommodation of silver employees, consisting of barracks, bathhouses, cook sheds, family quarters, and kitchens, to a total of 335.

Thirty-three buildings for the sanitary department, for use as hospitals, were constructed during the year, consisting of an insane hospital, leper colony, tuberculosis ward, a new hospital at Colon, 2 sixteen-bed hospitals at Gatun, and a number of other buildings for the same purpose.

A new two-room schoolhouse for white children was constructed at Culebra, and schoolhouses at Gatun, Cristobal, and Empire were commenced.

A machine and car repair shed, machine shop, engine house, pattern shop, and other structures for the manufacture and repair of machinery, amounting to a total of 10, were completed during the year, and extensive shop plants were commenced at Paraiso and Empire.

Seven mess halls for the accommodation of American employees and 11 for European laborers were completed during the year; also a large hotel at Tivoli Hill was completed during the latter part of 1906, together with quarters for help at that point, baggage room, etc.

Four commissaries, sanitary storehouses, and 1 corral were completed during the year, together with coal chutes at Las Cascadas and Pedro Miguel and division offices at Gatun and Ancon. Repairs were made to general offices at Panama, Ancon, Culebra, and Cristobal, at an expense of $14,735.79; also repairs and alterations to old French buildings, and to new buildings to be occupied as gold quarters at different stations along the Zone were made at an expense of $176,083.38, together with alterations, improvements, and repairs to buildings throughout the Zone, occupied as quarters for silver employees. In repairs to hospital buildings at various points $54,172.54 were expended. Several buildings were repaired for school purposes, and a number of buildings occupied as shops were also altered and repaired. A number of old French buildings were turned into mess halls for European employees and repairs made to hotels for the accommodation of American employees.

House No. 1 at Cristobal was remodeled for occupancy as a general office building, and a number of division buildings were repaired during the year. Miscellaneous buildings to the number of 27 were completed, including 8 fire department buildings, 10 jails, and 4 post-office buildings. During the year it was decided to change the residence which was being constructed at Santa Rosa (Ancon), designed to be used as the governor's residence, into a general office building, to be used by the departments of sanitation and civil administration. The expense in constructing miscellaneous buildings was $210,867.71, a large portion of which was for changes and alterations for the conversion of the last above-mentioned building into an administration building. This building is not yet entirely completed, but the work thereon is steadily progressing.

Four Y. M. C. A. clubhouses have been constructed, at Culebra, Empire, Gorgona, and Cristobal. These houses are large and com-

modious, are in charge of a secretary, and contain billiard tables, bowling alleys, library, rooms for games of all sorts, soda fountain—in fact, everything deemed necessary for the amusement of employees; also two large halls have been completed for church purposes, lodge halls, and meeting places for secret societies.

A building was erected for use as an electric-light plant at Empire, the cost of this structure being $8,137.22.

Manufacturing plants have been operated by this division at Ancon and Lirio. The plant at Ancon consists of a planing mill and a machine and tinsmith shop, and has done nearly all the work of that description required by this division and much for outside divisions and departments. The plant at Lirio is a planing mill, at which are manufactured sash, doors, and blinds; lumber planed and ripped into other sizes; desks, etc., manufactured for other divisions, together with the work of a general planing mill. An addition was made to this planing mill during the year in order to enlarge its capacity, and it is now running on full time and turning out work rapidly. The amount expended during the year on the manufacturing account was $276,884.19.

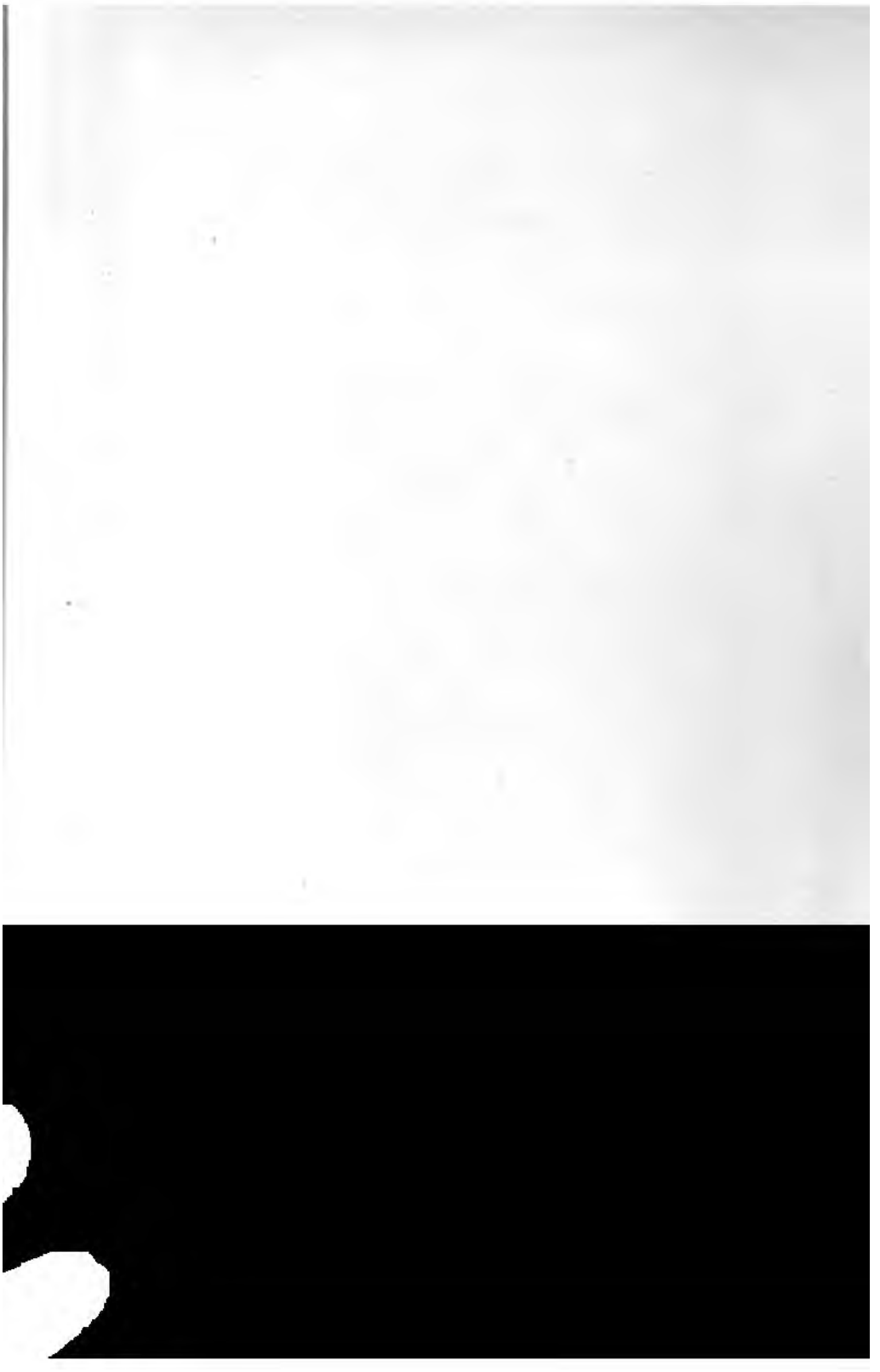
A number of storehouses have been repaired during the year, particularly that situated at Mount Hope, which was destroyed by fire. The work is not yet completed, but is steadily progressing.

Of the 2,265 buildings which were received from the French Canal Company 252 were repaired during the year and 113 were destroyed, leaving a balance of 678 of these buildings yet to be repaired, remodeled, or demolished. A total of 767 new buildings have been constructed during the present fiscal year ending June 30, 1907, and there were on hand on that date 2,919 buildings of all classes.

Material for the work of this division during the year has been received in a fairly prompt manner, but the work has been considerably delayed on account of the want of flooring, ceiling, and siding, which has been difficult to obtain in quantities desired. During the year one entire cargo of lumber was lost at sea, amounting to some 750,000 feet, and another ship containing lumber for the Commission ran on the rocks and 250,000 feet were jettisoned, making a total nondelivery of 1,000,000 feet of lumber at the time the division was greatly in

BEDROOM IN FAMILY QUARTERS

TYPICAL CAMP OF NEGRO LABORERS AT PARAISO.



OLD STYLE KITCHEN FOR NEGRO LABORERS AT COMACHO.

NEW STYLE KITCHEN FOR NEGRO LABORERS NEAR GORGONA.

The class of skilled labor recruited in the United States has been fairly effective, although in a number of cases men have been sent down as carpenters at the highest rate of wages who proved on trial to be inefficient and were either disrated or discharged. Much of the West Indian labor used in the division has been replaced by European labor. While the hourly rate for European labor is somewhat more the results are much greater than from West Indian labor and have proved more satisfactory.

The following is a list of quarters for gold employees completed during the year:

	Rooms per house.	Number of houses.	Total number of rooms.
Family quarters:			
Type 1	10	12	120
Type 3	10	2	20
Type 4	10	3	30
Type 7	6	25	150
Type 8	8	5	40
Type 14	16	25	400
Type 15	3	51	153
Type 17	5	31	155
Type 19	8	2	16
Type A	3	10	30
Type F	8	5	40
Special type	.....	6	66
Bachelor quarters:			
Type 5	8	56	448
Type 16	4	12	48
Type 18	24	11	264
Total	.....	256	1,980

The following new buildings were completed during the year for silver employees:

Range closets	70
Cook shed	71
Standard S. D. kitchens	31
Laborers' barracks	124
Laborers' bathhouses	24
Family quarters	15
Total	335

The following is a list of hospital buildings completed:

Type.	Rooms per house.	Number of houses.	Total rooms.
ANCON.			
Bachelors' quarters: Special type	45	1	45
Nurses' quarters: Special type	34	1	34
Other quarters:			
Type 3	10	1	10
Type 13	8	6	48
	.....	9	137
COLON.			
Nurses' quarters: Special type	49	1	49
Other quarters:			
Type C	7	3	21
Type 3	10	1	10
Type 13	8	1	8
	.....	6	88
Total	.....	15	225

The following new mess halls were completed: For gold employees, 8 (including Tivoli Hotel); for silver employees, 11; total, 19.

The following miscellaneous buildings were constructed for the departments of sanitation and civil administration:

Fire department buildings	8
Jails	10
Church	1
Office building	1
Post-offices	4
Fumigation houses	3
Total	27

During the year the number of men under the architect has varied, as shown in the following table, and at present consists of 9 draftsmen and an estimator.

1906.		1907.	
July	7	January	11
August	8	February	11
September	8	March	11
October	11	April	11
November	13	May	12
December	12	June	11

There have been prepared during the year 145 finished sets of drawings, consisting of 605 sheets of tracings and bills of material for most of these sets. Below is given a general classification of the drawings:

List of completed plans made during the fiscal year 1906–7.

Classification of drawings.	Complete sets.	Total number of tracings.
Hospital buildings	24	95
Type houses and residences	14	87
Official residences	3	37
Court-houses and jails, etc	3	17
Mess halls, barracks (gold)		
Commissaries and Y. M. C. A	7	50
Silver quarters	5	10
Shops, mills, wharves, and storehouses	9	31
Maps and plats	5	5
Miscellaneous	80	73

[redacted]

The following table shows the total number of employees during the year, with number in service at the end of the fiscal year:

Branch of service.	Discharged for cause.	Discharged for disability.	Resigned or left the service.	Transferred.	Deaths.	In service June 30.	Total.
General office, drafting room and general supervision	9	5	39	12	.....	154	219
Construction and repair force:							
Foremen	11	.....	17	14	.....	74	116
Carpenters	189	6	391	30	4	713	1,333
Plumbers	41	1	66	3	1	83	195
Painters	48	.....	49	2	.....	47	146
Masons	5	.....	1	.....	.....	4	10
Bricklayers	2	1	3	1	.....	11	18
Plasterers	8	.....	10	.....	.....	10	28
Machinists and blacksmiths	2	.....	3	.....	.....	7	12
Tinsmiths	2	.....	4	.....	.....	1	7
Total	317	13	583	62	5	1,104	2,084

Amounts expended account of pay rolls during fiscal year ended June 30, 1907.

For office and supervisory forces, gold rolls	$358,006.95
For skilled labor, gold rolls	1,154,671.40
For skilled and unskilled labor, silver rolls	1,047,569.80
Total, United States currency	2,560,248.15

Average rate of pay, per hour:	Cents.
Gold employee, United States currency	60.9
Silver employee, Panamanian currency	32.7
All employees, United States currency	28.8

Statement of buildings repaired and constructed, demolished, remaining, and totals, from July 1, 1906, to July 1, 1907.

Town or railroad station.	Number on hand July 1, 1906.	Number previously repaired.	Number repaired this year.	Number destroyed.	Balance to be repaired.	Number previously constructed.	Number constructed this year.	Class of construction.	Number on hand July 1, 1907.
Palo Seco	.....	.....	.....	.....	.....	.....	8	Hospital	8
Taboga	8	1	1	.....	6	.....	1	.....do	9
Naos	3	1	.....	.....	2	.....	.....	.....	3
Flamenco	2	.....	.....	.....	.....	.....	.....	.....	2
Farfan	3	.....	.....	.....	3	.....	.....	.....	3
La Boca	67	29	7	2	18	11	24	21 quarters, 1 storehouse, 1 fire-department building, 1 mess hall.	89
Panama City	4	3	.....	.....	.....	1	.....	.....	4
La Seccion	24	7	1	.....	15	1	.....	.....	24
Ancon	116	46	19	1	25	25	60	45 quarters, 1 mess hall, 4 hospitals, 1 jail, 1 fire-department building, 1 chapel, 2 offices, 1 hotel, 4 miscellaneous.	175
Las Sabanas	.....	.....	.....	.....	.....	.....	1	.....	1
Corozal	36	25	6	.....	.....	5	18	16 quarters, 2 mess halls	54
Rio Grande Inferior	7	.....	.....	.....	7	.....	.....	.....	7
Butte Cardenas	2	.....	.....	.....	2	.....	.....	.....	2
Ecluse 10	13	.....	.....	.....	13	.....	.....	.....	13
Miraflores	31	28	.....	.....	3	.....	.....	.....	31
Pedro Miguel tank	21	7	.....	.....	14	.....	.....	.....	21
Ecluse 9	11	.....	.....	.....	11	.....	.....	.....	11
Pedro Miguel	30	9	.....	3	9	9	24	15 quarters, 3 storehouses, 3 offices, 1 fire-department building, 1 mess hall, 1 car-repair shed.	51

Statement of buildings repaired and constructed, demolished, remaining, and totals, from July 1, 1906, to July 1, 1907—Continued.

Town or railroad station.	Number on hand July 1, 1906.	Number previously repaired.	Number repaired this year.	Number destroyed.	Balance to be repaired.	Number previously constructed.	Number constructed this year.	Class of construction.	Number on hand July 1, 1907.
Forty-mile Siding	21	20	.....	.....	.....	1	9	9 quarters, etc.	30
Kilometer 58.600	3	.....	.....	.....	3	.....	.....	.....	3
Ecluse 7 and 8	1	.....	.....	.....	1	.....	.....	.....	1
Ecluse 8	7	.....	.....	.....	.....	.....	.....	.....	7
Paraiso	97	51	6	4	22	14	43	39 quarters, 1 mess hall, 1 hospital, 1 commissary, 1 fire-department building.	136
Carthagenela	24	22	.....	.....	2	.....	8	8 quarters	32
Ecluse 7	7	.....	.....	.....	7	.....	.....	.....	7
Cucaracha	31	24	1	1	5	.....	9	7 quarters, 1 mess hall, 1 storehouse.	39
Enterprise	42	1	1	23	9	8	13	13 quarters	32
Rio Grande	9	4	2	1	.....	2	25	24 quarters, 1 corral	33
Cerro Germain	11	5	3	.....	.....	3	6	3 quarters, 1 shop, 1 storehouse, 1 mess hall.	17
Cerro Lirio	40	35	5	.....	.....	.....	.....	.....	40
Culebra	147	74	6	7	12	48	67	55 quarters, 3 storehouses, 1 band stand, 1 clubhouse 1 lodge hall, 1 fumigation building, 1 school house, 1 hospital addition, 1 lockup, 1 hotel laundry, 1 fire department building.	207
Lirio	29	27	.....	.....	.....	2	5	3 quarters, 1 shop, 1 office.	34
Cerro	23	21	.....	.....	.....	2	3	3 quarters	26
Empire	108	57	7	3	24	17	63	48 quarters, 1 jail, 4 offices, 1 mess hall, 1 clubhouse, 1 fire department building, 1 electric-light plant building, 1 hotel laundry, 1 fumigation house, 3 storehouses, 1 ice platform.	168
Cunette	60	47	2	6	5	.....	9	9 quarters	62
Casa Blanca	47	20	16	11	.....	.....	3	3 quarters	39
Las Cascadas	58	40	13	3	2	.....	43	5 shops, 33 quarters, 1 hotel laundry, 1 mess hall, 1 office, 2 miscellaneous.	98
Buena Vista	49	30	13	1	5	.....	2	2 quarters	50
Haut Obispo	59	53	4	1	.....	1	11	10 quarters, 1 storehouse	69

Statement of buildings repaired and constructed, demolished, remaining, and totals, from July 1, 1906, to July 1, 1907—Continued.

Town or railroad station.	Number on hand July 1, 1906.	Number previously repaired.	Number repaired this year.	Number destroyed.	Balance to be repaired.	Number previously constructed.	Number constructed this year.	Class of construction.	Number on hand July 1, 1907.
Tabernilla	25	22	2	.....	.....	1	34	28 quarters, 1 jail, 2 mess halls, 1 office, 2 storehouses.	59
Ec. Enterprise	16	14	.....	2	.....	.....	.....	.....	14
Sin La Voie du kilometer 29	6	.....	5	1	.....	.....	1	1 cook shed	6
Chagres	12	.....	.....	12	.....	.....	.....	.....	12
Frijoles	2	2	.....	.....	.....	.....	1	1 cook shed	3
Bohio	47	16	4	.....	27	.....	.....	.....	47
Chagres	33	.....	.....	.....	33	.....	.....	.....	33
New Town	1	.....	.....	.....	1	.....	.....	.....	1
Derivation 4	5	.....	.....	.....	5	.....	.....	.....	5
Ecluse 1	18	.....	.....	.....	18	.....	.....	.....	18
Derivation 3	3	.....	.....	.....	3	.....	.....	.....	3
Penas Blancas Arriba	3	.....	.....	.....	3	.....	.....	.....	3
Penas Blancas, Q.L.	7	.....	.....	.....	7	.....	.....	.....	7
Vamos Vamos	1	.....	.....	.....	1	.....	.....	.....	1
Gatun	5	1	.....	.....	4	.....	92	73 quarters, 1 jail, 2 mess halls, 8 storehouses, 3 offices, 1 hospital, 4 miscellaneous.	97
Mindi	3	.....	.....	.....	3	.....	.....	.....	3
Mount Hope	20	5	2	.....	12	1	4	1 jail, 2 quarters, 1 boiler house.	24
Cristobal and Fox River.	249	121	8	5	96	19	74	61 quarters, 2 hospitals, 3 storehouses, 1 jail addition, 1 fire department building, 2 shops, 1 clubhouse, 1 lodge hall, 1 office, 1 band stand.	318
Total	2,265	1,018	252	113	678	204	767	.....	2,919

Palo Seco.—The following buildings were completed during the year: Leper colony, 8 buildings. The lepers were removed from Miraflores to Palo Seco in the early part of 1907.

Taboga.—Repairs were made to the sanitarium laundry. The following new building was completed:

N-1941, sanitarium storehouse.

La Boca.—Seven buildings were repaired for occupancy as quarters, mess hall, and office. The following construction work was completed during the year:

N-1264, 2 water-closets.
N-1265 fire department building.
N-1266, 1 range closet.
N-1267, 2 cook sheds.
N-1268, 10 standard laborers' barracks, No. 2 (Sosa Hill).
N-1269, 1 standard laborers' kitchen, S. D.
N-1270, Gallegos' mess hall and kitchen.
N-1271, tool house.
N-1272, 3 range closets (Sosa Hill).
N-1273, laborers' bath-house (Sosa Hill).

Division office building at Sosa Hill was commenced on May 7, 1907, and was 70 per cent complete on July 1, 1907.

Ancon.—Nineteen buildings were repaired for occupancy as quarters, mess hall, and hospital purposes. The following new buildings were completed during the year:

N–14, bachelor quarters, sanitary department.
N– 9, insane hospital used for other hospital cases.
N–17, tuberculosis ward.
N–18, nurses' quarters.
N–20, ward maids' quarters.
N–29, six type 13 houses.
N–30, jail.
N–31, pump house.
N–32, boiler house.
N–35, bath and toilet room.
N–36, fire department buildin;.
N–37, kitchen for jail.
N–39, second story to wards Nos. 18 and 19.
N–40, one cook shed.
N–41, chapel.
N–46, four standard laborers' barracks No. 2 (leper camp).
N–47, one standard laborers' kitchen, S. D. (leper camp).
N–48, laborers' bath house (leper camp).
N–49, one range closet.
N–50, gallegos' mess hall and kitchen.
N–51, six standard laborers' barracks No. 2 (Fort Tivoli Hill).
N–52, fifty-two laborers' bath houses (Fort Tivoli Hill).
N–53, one range closet.
N–59, one type No. 3 house.
N–60, building department office and storeroom.
N–65, one type 15 house.
N–72, sick camp (camp No. 2).

In addition to the above, several buildings to be used for insane asylum are partially completed. Also many quarters for gold employees and several new buildings for hospital purposes.

La Section.—Repairs were made to one building occupied as quarters.

Santa Rosa.—It was decided during the year to convert new residence being constructed for the governor into an administration building. Work on same has been prosecuted throughout the year and the building was 47 per cent complete July 1, 1907.

Tivoli Hill.—The large hotel at this place, 170 by 315 feet, was

Corozal.—Six buildings were repaired for use as quarters, post-office, and jail. The following new buildings were completed:

N–457, laborers' bath house.
N–458, three range closets.
N–459, two cook sheds.
N–460, Gallegos' mess hall and kitchen.
N–461, one standard laborers' kitchen, S. D.
N–463, five standard laborers' barracks, No. 2.
N–464, one standard laborers' kitchen, S. D.
N–465, Gallegos' mess hall and kitchen.
N–466, two range closets.
N–467, laborers' bath house.

Pedro Miguel.—The following new buildings were completed during the year:

N–1809, post-office.
N–1810, mess hall.
N–1811, coal chute.
N–1812, four type 16 houses.
N–1813, ten type 17 houses.
N–1814, laborers' bath house.
N–1816, fire department building.
N–1817, one standard laborers' barracks.
N–1818, six range closets.
N–1819, cement storehouse.
N–1820, plumbers' storehouse.
N–1821, building superintendent's office.
N–1824, two standard laborers' kitchens, S. D.
N–1825, car-repair shed.
N–1828, yardmaster's office.

Paraiso.—Repairs to six buildings used for occupancy as quarters, storehouses, office, and jail. The following new buildings were completed during the year:

N–1712, ten houses, type A, family quarters, negro mechanics.
N–1713, five houses, type F, white family quarters.
N–1714, one bachelor quarters, type 5.
N–1717, one type 1 house.
N–1719, sixteen-bed hospital.
N–1722, ten type 15 houses.
N–1723, three range closets.
N–1724, three cook sheds.
N–1725, laborers' bath house.
N–1726, mess hall.
N–1727, commissary.
N–1728, one standard laborers' kitchen, S. D.
N–1729, two type 5 houses.
N–1730, one range closet.
N–1739, fire department building.
N–1742, one laborers' family quarters.

An extensive shop plant is now in progress of construction.

Carthagencita.—The following new buildings were completed during the year:

N–1720, four cook sheds.
N–1721, three range closets.
N–4000, one standard laborers' kitchen, S. D.

Cucaracha.—Repairs were made to one building used as pump house. The following new buildings were completed during the year:

N–502, tool shed for sanitary department.
N–503, laborers' bath house.
N–504, three cook sheds.
N–505, two range closets.
N–506, Gallegos' mess hall and kitchen.
N–507, one standard laborers' kitchen, S. D.

Rio Grande.—Eight buildings were repaired for occupancy as quarters, mess hall, sick camp, and air-compressor plant. The following new buildings were completed during the year:

N–1923, five laborers' camps.
N–3590, mule stable.
N–3591, laborers' bath house.
N–3592, two range closets.
N–1925, four closets.
N–1927, ten cook sheds.
N–1933, two standard laborers' kitchens, S. D.

Enterprise.—The following new buildings were completed during the year:

N–1150, four family quarters (negro mechanics).
N–1152, one range closet.
N–1923, eight laborers' barracks.

Gold Hill.—Repairs were made to three buildings occupied as quarters. The following new buildings were completed during the year:

N–585, kitchen.
N–586, bath house.
N–607, engine house.
N–620, dynamite magazine.
N–611, Gallegos' mess hall and kitchen.
N–613, double dry closet.

Culebra.—Repairs to six buildings used as quarters, hospital purposes, storehouses, hotel, etc., were made. The following new buildings were completed during the year:

N–558, corral annex.
N–567, one house, type 4.
N–568, one house, type 5.
N–570, two houses, type 7.
N–571, one house, type 8.
N–576, seven houses, type 14.
N–578, assistant chief engineer's house.
N–582, fifteen type, 15 houses.
N–584, band stand.
N–587, fire department building.
N–588, three houses, type 5.
N–589, ten houses, type 15.

TYPICAL CAMP FOR EUROPEAN LABORERS AT JUAN GRANDE.

INTERIOR OF MESS HALL FOR EUROPEAN LABORERS AT GOLD HILL.

MESS HALL FOR EUROPEAN LABORERS AT GOLD HI

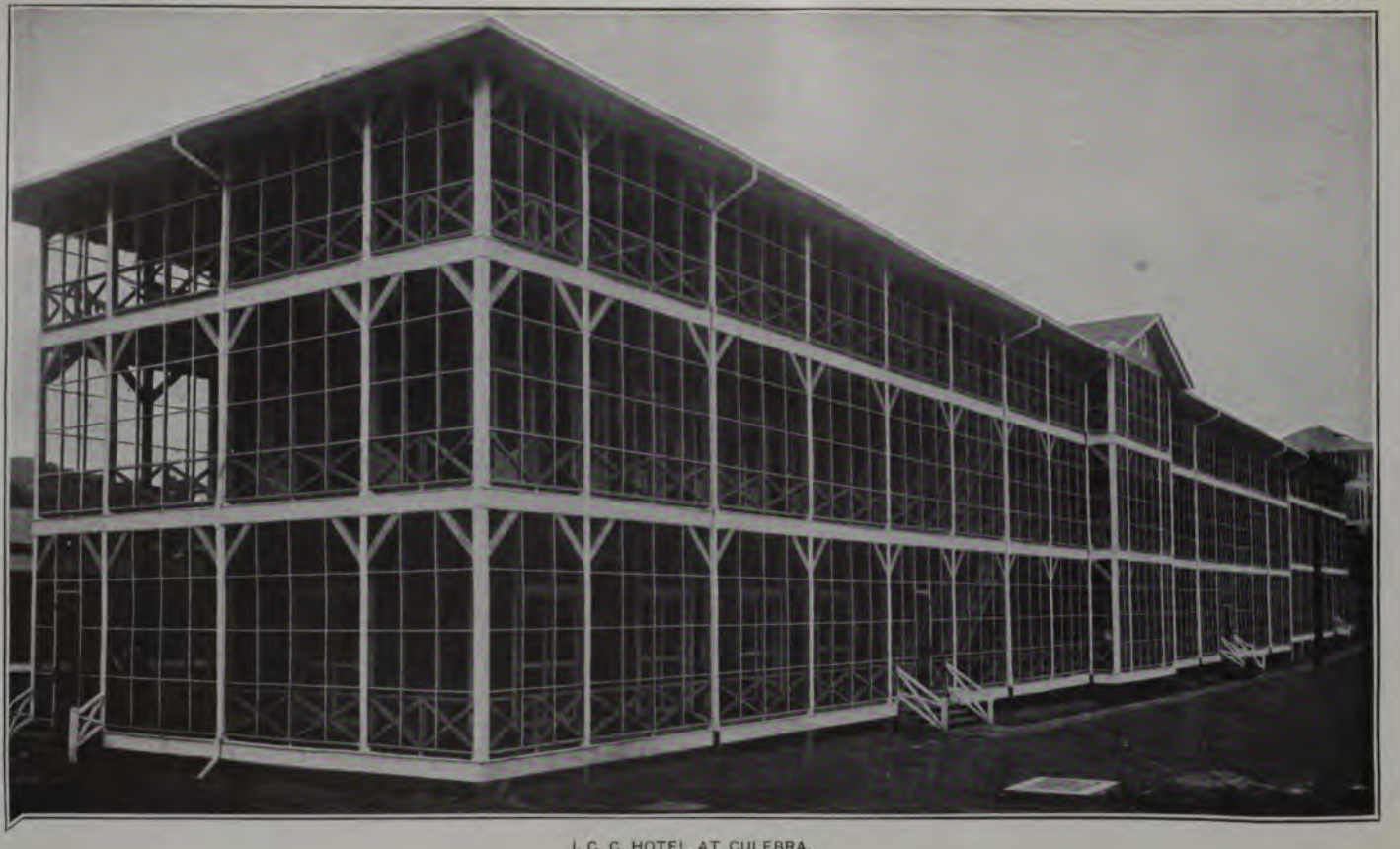
MESS-HALL KITCHEN FOR EUROPEAN LABORERS.

TYPE NO. 13, ONE-FAMILY HOUSE AT ANCON.

NURSES' QUARTERS AT ANCON.

TYPE NO. 13, ONE-FAMILY HOUSE AT ANCON.

FIRE COMPANY AND HOUSE AT ANCON.



I. C. C. HOTEL AT CULEBRA.

TYPE NO. 15, ONE-FAMILY HOUSE AT CULEBRA.

TYPICAL FAMILY QUARTERS FOR NEGRO EMPLOYEES.

SLEEPING QUARTERS FOR NEGRO LABORERS.

SLEEPING QUARTERS FOR EUROPEAN LABORERS.

TYPE NO. 17, ONE-FAMILY HOUSE AT EMPIRE.

DISBURSING OFFICE AND QUARTERS AT EMPIRE.

Y. M. C. A. CLUBHOUSE AT CULEBRA.

LOBBY, Y. M. C. A. CLUBHOUSE AT CRISTOBAL.

CARD AND SMALL GAME ROOM, Y. M. C. A. CLUBHOUSE AT CRISTOBAL.

TYPE NO. 8, ONE-FAMILY HOUSE AT CULEBRA.

CHIEF ENGINEER'S RESIDENCE, ADMINISTRATION BUILDING, AND BACHELOR QUARTERS AT CULEBRA.

TYPICAL LABOR TRAIN.

CULEBRA PENITENTIARY.

Cerro.—The following new buildings were completed during the year:

N–3580, bath house.
N–3581, closet.
N–3582, white police officers' quarters.

Empire.—Repairs were made to seven buildings used for occupancy as quarters, storehouses, church, and air-compressor plant. The following new buildings were completed during the year:

N–1000, new jail.
N–1009, auditing and disbursing offices.
N–1010, one house, type 5.
N–1011, two family quarters, type 14.
N–1013, one type 3 house.
N–1014, court-house, second judicial district.
N–1015, two type 4 houses.
N–1016, six type 7 houses.
N–1017, two type 5 houses.
N–1018, cook shed.
N–1019, pump keeper's residence (Camacho).
N–1020, three type 5 houses.
N–1022, mess hall.
N–1024, fire-department building.
N–1026, one range closet.
N–1027, five type 5 houses.
N–1028, one standard laborers' barracks.
N–1031, post-office.
N–1032, clubhouse.
N–1033, electric light plant building.
N–1034, one standard laborers' barracks.
N–1035, silver mess kitchen.
N–1036, four type 17 houses.
N–1038, six type 7 houses.
N–1039, ten type 5 houses.
N–1040, cement storehouse.
N–1042, hotel laundry.
N–1057, corral.
N–1058, office building (new shops).
N–1059, ice platform.
N–1062, motor car house.
N–1064, fumigation house.

An extensive shop plant is being constructed. Also many houses for gold employees.

Cunette.—Repairs were made to two buildings for occupancy as quarters. The following new buildings were completed during the year:

N– 596, four range closets.
N– 597, four cook sheds.
N–4020, one standard laborers' kitchen, S. D.

Casa Blanca.—Sixteen buildings were repaired in this encampment for occupancy as quarters. The following new buildings were completed during the year:

N– 595, two cook sheds.
N–4010, one standard laborers' kitchen, S. D.

Las Cascadas.—Repairs were made to thirteen buildings used for occupancy as quarters, offices, and hospital. The following new buildings were completed during the year:

N–1502, machine shop.
N–1503, oil house.
N–1504, engine house.
N–1505, coal chute.

N–1506, mess hall.
N–1507, seven type 16 houses.
N–1508, ten type 15 houses.
N–1510, air compressor plant.
N–1511, one cook shed.
N–1512, standard laborers' kitchen, S. D.
N–1513, two type 18 dormitories.
N–1514, ten type 7 houses.
N–1515, white laborers' bath house.
N–1517, pump shed.
N–1518, hotel laundry.
N–1519, one range closet (shops).
N–1520, hotel boiler shed.
N–1521, post-office.

Buena Vista.—Repairs were made to thirteen buildings used for occupancy as quarters, mess hall, and pump shed. The following new buildings were completed during the year:

Two cook sheds.

Haut Obispo.—Repairs were made to twenty-two buildings used for marine encampment, mess hall, laborers' quarters, etc. The following new buildings were completed during the year:

N–3101, ammunition storehouse.
N–3102, three range closets.
N–3103, five cook sheds.
N–3104, one standard laborers' kitchen, S. D.
N–3105, laborers' bath house.

Bas Obispo.—Repairs were made to five buildings used for occupancy as quarters and church. The following new buildings were completed during the year:

N–152, jail.
N–161, mule stable.
N–165, commissary.

Gamboa.—Repairs were made to two buildings used for occupancy as quarters and sick camp. The following new buildings were completed during the year:

N– 160, silver mess kitchen.
N– 162, Gallegos' mess hall and kitchen.
N–3150, laborers' bath house.

Santa Cruz.—This encampment was ordered repaired in January, 1907, and forty-three houses have been repaired during the fiscal year; also one standard laborers' kitchen, S. D., was constructed.

Bas Matachin.—Repairs were made in seven buildings used for occupancy as quarters, shops, and storehouses. The following new buildings were completed during the year:

N-113, pattern and car machine shop.
N-114, addition to car repair shop.
N-116, five colored family quarters.
N-117, two cook sheds.
N-118, bar iron rack.
N-119, instrument repair shop.
N-122, three standard laborers' barracks No. 2.
N-124, laborers' bath house.

Gorgona.—Repairs were made to 14 buildings used for occupancy as quarters, schoolhouse, storehouses, church, etc. The following new buildings were completed during the year:

N-1181, jail.
N-1182, three houses type 1.
N-1184, four type 1 houses.
N-1185, two-room addition to house No. 46.
N-1186, pump keeper's residence.
N-1187, mess hall.
N-1188, six type 5 houses.
N-1189, corral.
N-1190, fire department building.
N-1191, hotel-help quarters, No. 1.
N-1192, band stand.
N-1193, hotel laundry.
N-1194, plumbers' storehouse
N-1195, clubhouse.
N-1197, commissary.
N-1198, five type 5 houses.
N-1199, one type 15 house.
N-1200, cement storehouse.
N-1201, hotel-help quarters, No. 2.
N-1202, one type 5 house.
N-1204, two type 18 dormitories.
N-1205; three type 14 houses.
N-1206, one type 7 house.

Caballo Viejo.—Repairs were made to four buildings used for occupancy as quarters. The following new buildings were completed during the year:

N- 592, laborers' bath house.
N- 593, closet and bath.
N-3250, three range closets.
N-3251, three cook sheds.
N-3252, silver mess kitchen.
N-3253, two standard laborers' kitchens, S. D.

Juan Grande.—Work repairing this encampment was started during the year and 10 buildings were repaired, used for occupancy as quarters and mess hall. The following new buildings were completed during the year:

N-1196, one cook shed.
N-3500, silver mess kitchen.
N-3501, Gallegos' mess hall and kitchen.
N-3502, laborers' bath house.
N-3503, one range closet.

Mamei.—Repairs were made to two buildings used for occupancy as quarters. The following new buildings were completed during the year:

N-3300, three cook sheds.
N-3302, Gallegos' mess hall and kitchen.
N-3303, one type 16 house.
N-3304, laborers' bath house.

San Pablo.—Seven buildings were repaired for occupancy as quarters. The following new buildings were completed during the year:

N-2000, jail.
N-3350, one cook shed.

Tabernilla.—Repairs were made to two buildings for occupancy as quarters. The following new buildings were completed during the year:

N-2020, jail.
N-3026, yard-master's shanty.
N-3027, three range closets.
N-3028, three standard laborers' barracks.
N-3029, two laborers' bath houses.
N-3031, Gallegos' mess hall and kitchen.
N-3451, four cook sheds.
N-3452, sand house.
N-3453, 10 standard laborers' barracks.
N-3454, one type 5 house.
N-3455, two standard laborers' kitchens, S. D.
N-3456, two laborers' bath houses.
N-3457, mess hall.
N-3459, tool house.
N-3460, hotel-help quarters.

Sin la Voie.—Five buildings were repaired for occupancy as quarters. The following new building was completed during the year:

N-3540, one cook shed.

Frijoles.—The following new building was completed during the year:

N-4070, one cook shed.

N–4030, one type 8 house.
N–4031, ten standard laborers' barracks.
N–4032, two standard laborers' kitchens, S. D.
N–4033, office building, division engineer.
N–4034, Gallegos mess hall and kitchen.
N–4035, twenty-four-bed hospital.
N–4036, five colored family quarters.
N–4040, post-office.
N–4041, commissary.
N–4042, one standard laborers' kitchen, S. D. (spillway).
N–4043, two standard laborers' barracks (spillway).
N–4044, powder house.
N–4045, one type 8 house.
N–4046, one type 18 dormitory.
N–4048, hotel-help quarters No. 2.
N–4049, fluviograph house.
N–4051, fumigation room.
N–4052, one laborers' bath house.
N–4053, tool house (spillway).
N–4059, cement shed.
N–4060, sand-drying plant.
N–4061, distilling shed.
N–4062, paint shop.

Mount Hope.—Repairs were made to two buildings used for occupancy as repository and church. The following new buildings were completed during the year:

N– 304, boiler house.
N–1701, new jail.
N–1702, pump keeper's residence.
N–1703, one type 15 house.

The large warehouse belonging to material and supplies department was partially destroyed by fire and is now being rebuilt.

Cristobal.—Repairs were made to eight buildings used for occupancy as quarters, schoolhouse, church, and office. The following new buildings were completed during the year:

N–264, jail, addition.
N–284, three type 1 houses.
N–286, two 2-story dormitories.
N–287, one house type 1.
N–288, one house type 3.
N–289, twenty-four standard laborers' barracks.
N–298, fire department building.
N–302, band stand.
N–308, ten range closets.
N–309, three cook sheds.
N–311, one 24-room dormitory.
N–312, two type 14 houses.
N–313, clubhouse.
N–314, deck house on old barge (gold).
N–318, carpenter shop.
N–319, three standard laborers' kitchens, S. D.
N–321, bakery storeroom.
N–322, lodge hall.
N–323, machine-shop extension (dry dock).
N–324, time-keeping office.

House No. 1 is being remodeled to provide room for dispensary and court room.

Colon.—The following new buildings were completed for sanitary department:

N–262, new hospital on coral reef.
N–265, three family quarters, type C.
N–294, one type 3 house.
N–299, sanitary department storehouse.
N–300, nurses' home.
N–306, orderlies' quarters.
N–307, maids' quarters.
N–317, boathouse.

Porto Bello.—The following buildings have been started, to be used for occupancy as quarters by forces employed in stone-crusher work at that point:

N–4080, two standard laborers' barracks No. 2.
N–4081, one standard laborers' kitchen, S. D.
N–4082, one type 17 house.
N–4083, one type 5 house.

APPENDIX D.

REPORT OF THE HEAD OF THE DIVISION OF MATERIAL AND SUPPLIES.

CRISTOBAL, CANAL ZONE, *August 8, 1907.*

SIR: I have the honor to submit herewith the annual report of the division of material and supplies, Isthmian Canal Commission, Canal Zone, for the fiscal year July 1, 1906, to June 30, 1907:

The work of the division of material and supplies during the past fiscal year has been a general continuation of reorganization and consolidation features inaugurated during the fiscal year 1905–6. Material has been received by purchase to the value of approximately $9,500,000, of which over 90 per cent covers purchases made in the United States. Disbursements during the past fiscal year amounted to $9,000,000, an average monthly disbursement of $750,000, of which $230,000 represents value of material from old French stock.

New storehouses are under construction at Empire and Paraiso shops. At present we are utilizing the old French buildings at both of those places, but the business has been growing so rapidly that they have become entirely inadequate, necessitating the building of new storehouses, which will be located convenient to the new shops and of sufficient capacity to handle the present and anticipated business. In addition to the new storehouses, authority has been granted to erect 10 powder magazines, which are to be constructed of cement to make them fireproof, for the storage of explosives and to safeguard against the danger of having large quantities of explosives stored in only 2 magazines as at present. These will be located at different points on the Zone convenient for the work.

New corrals for our land transportation have been built at Gatun, Gorgona, Bas Obispo, Empire. and Culebra.

A disastrous fire occurred at Mount Hope general storehouse on April 1 of this year, practically destroying one-half of the building and resulting in the loss of material aggregating in value about $100,000. The fire broke out within a few minutes after the force left the building at the noon hour, and was supposed to have been caused either by sparks from a locomotive or smoking. Practically no delay was occasioned to the work on account of this fire, as a general stock was distributed over the Isthmus at different stores, so that we had sufficient material left on hand and on order to keep everything going until a new supply could be received from the States. Immediately after the fire, work was commenced clearing away the débris, sorting out salvage, and rebuilding the storehouse. The new building has been divided into three sections, with fire walls extending from the ground to the roof, so that should another fire occur there would be no difficulty in confining it between two walls.

The demand for building materials and supplies of all kinds, including construction supplies and equipment, has been heavy, constant, and urgent. During the past fiscal year the division of material and supplies has received 37 full cargoes of material and part cargoes from about 150 ships. Among other items handled there were 23,300,000 feet of lumber, 254,000 cross ties, 4,000 piles, and about 50,000 tons of miscellaneous cargo. We have also disposed of nearly 11,000 tons of scrap French material by sale to dealers in the United States, about 4,000 tons being shipped north as ballast for Panama Railroad boats when they were short of full cargoes of commercial freight. We have also used a large amount of scrap cast iron and scrap brass from the French stock, in our foundries at Gorgona shops, in connection with the work. A large amount of French material, consisting of boilers, pumps, Decauville track, cars, locomotives, cranes, and other material, has been put into use.

Our printing plant in Panama has been running to its full capacity, 14 printing presses being kept busy, besides the book-binding department. About 24,000,000 pieces of printed matter have been turned out during the year. In addition to the printing required by the Commission, a large proportion of the printing required by the Panama Railroad has been done by our plant in Panama.

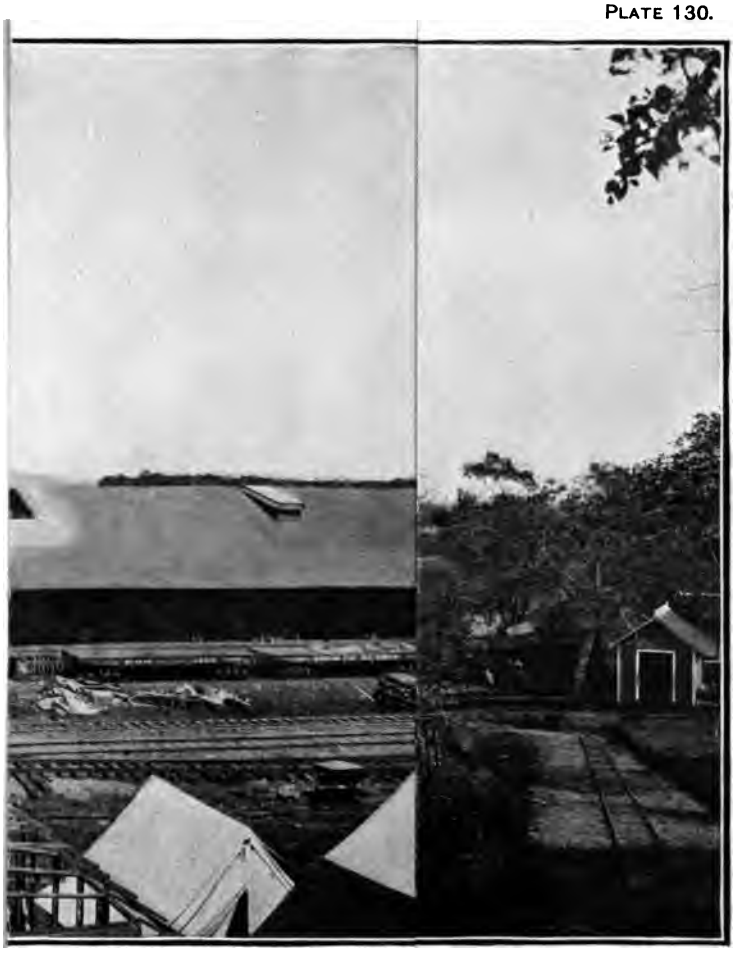
The estimate of expenditure for the division of material and supplies for the fiscal year 1906–7 was $943,897.24, but our expenditure was $755,321.89, being $188,575.35 under the estimate. The number of gold employees in this division is 252; silver, or colored employees, not including laborers, 534; colored laborers, 503; total, 1,289.

The organization is as follows:

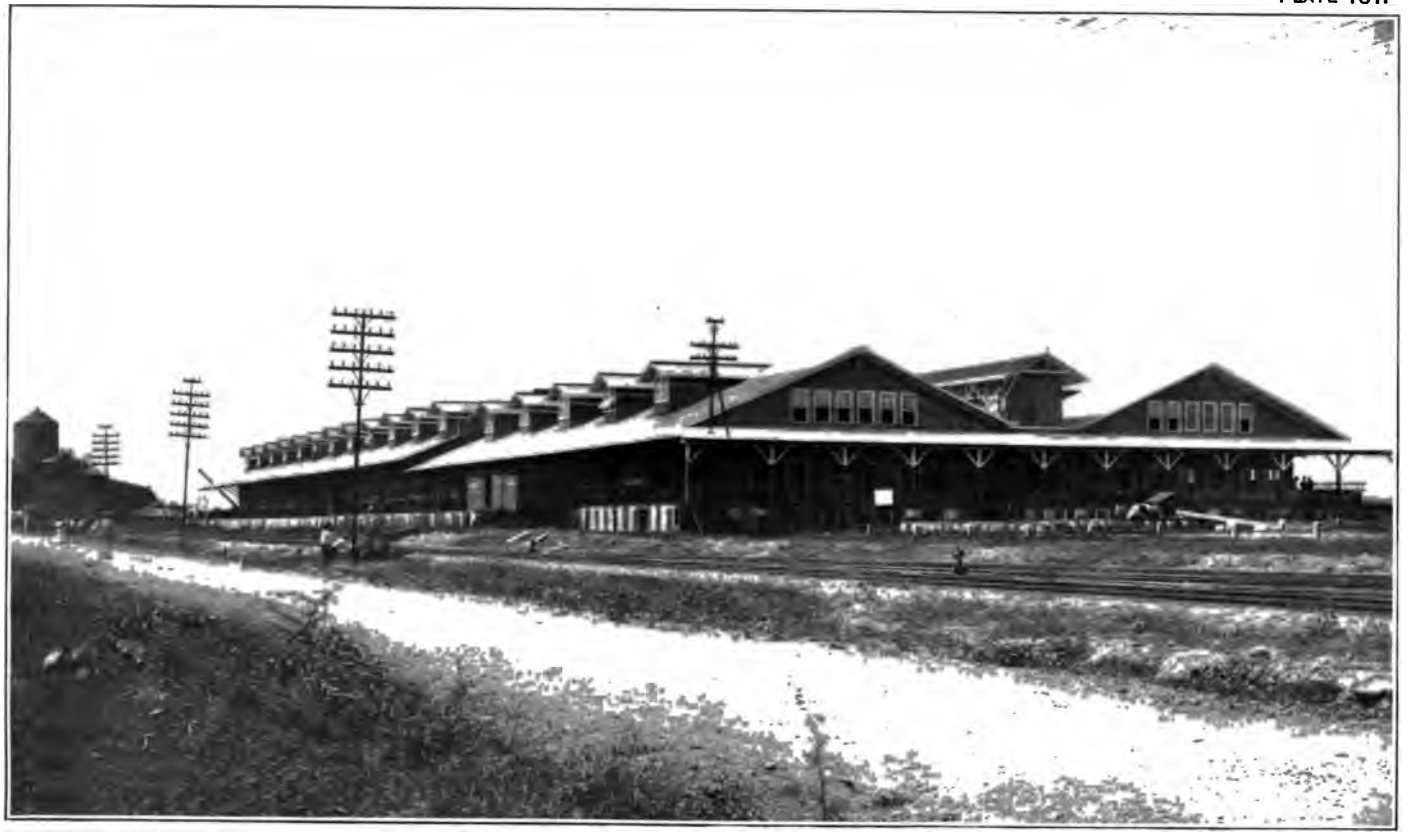
At Cristobal are located the headquarters of the chief of the division and the general offices of the division. In this office is handled all the clerical work in connection with the accounting of material and in ordering material and supplies from the States; also the placing of orders for supplies to be shipped from the storehouses to the various divisions on approved requisitions, or local purchases to be made from the Panama Railroad and Panama Railroad commissary, or on the Isthmus. All United States bills are handled at this office, and all papers in connection with shipments coming from the United States

OFFICE BUILDING, DIVISION OF MATERIAL AND SUPPLIES, AT CRISTOBAL.

PLATE 130.



ER FIRE ON APRIL 1, 1907.



MOUNT HOPE STOREHOUSE AS REBUILT SINCE FIRE ON APRIL 1, 1907.

LOOKING THROUGH ONE OF THE FIRE WALLS, ON THE GROUND FLOOR, AT THE MOUNT HOPE STOREHOUSE AS REBUILT.

SECTION "A," MOUNT HOPE STOREHOUSE, SHOWING SHELF HARDWARE.

required by the mechanical department in their shops and foundry. The storekeeper at Empire has jurisdiction over the district between Bas Obispo and Paraiso (which includes the stores at Bas Obispo, Empire, and Culebra, the lumber yard at Culebra, the corrals at Culebra and Empire, and the powder magazines at Bas Obispo and Culebra). This is the most important store on the Isthmus—outside of Mount Hope store—as all maintenance-of-way material, train supplies, repairs and supplies for steam shovels, drills, locomotives, cars, etc., used on the Culebra division are furnished from Empire store. The Paraiso store furnishes all material and supplies for locomotives, steam shovels, etc., used at the south end of Culebra cut; also supplies for the mechanical division, which maintains shops at that point. Ancon store furnishes all material and supplies, forage, etc., required at the Ancon corrals and the minor supplies required by the other departments at Panama and Ancon. The La Boca store furnishes all material and supplies required by La Boca shops and for the floating equipment and for other departments at or in the vicinity of La Boca. The storekeeper at this point also has charge of the La Boca lumber yard.

The printing plant and stationery department is in the administration building, Panama, and handles all the stationery and printing required by the various departments on the Isthmus; also supplies for the engineering department, such as transits, levels, steel tapes, office supplies, etc., and also a large portion of the printing and stationery required by the Panama Railroad. Rubber stamps are also manufactured by this department. The plant consists of fourteen presses, which are operated by a gasoline engine, ruling machines, paper cutters, bindery, etc., which go to make up a complete printing establishment. This plant is kept running at full capacity at all times.

The division of material and supplies also has charge of all land transportation, which, at the present time, consists of about 600 horses and mules, with the necessary wagons, carts, carriages, ambulances, and other equipment. Corrals are located at Cristobal, Gatun, Tabernilla, Gorgona, Bas Obispo, Las Cascadas, Empire, Culebra, Paraiso, Corozal, Ancon, and La Boca. The corral staffs consist of one superintendent of transportation and veterinary surgeon, with headquarters at Cristobal, with jurisdiction over the large number of animals at Cristobal, Colon Hospital, and Gatun, and one assistant superintendent of transportation and veterinary surgeon at Ancon to take care of the business at that end, the two largest corrals being at Ancon and Cristobal. Each corral is under the immediate jurisdiction of a corral foreman. The superintendent of transportation and veterinary surgeon make weekly visits to all corrals on the Isthmus and oftener if necessary, so that the efficiency of the force and maximum amount of work from the animals and proper care of same is procured. We also have a system of daily reports from each of the corral foremen, which keeps the head of the division continually in touch with the business and conditions at each point. This not only applies to corrals but to storehouses.

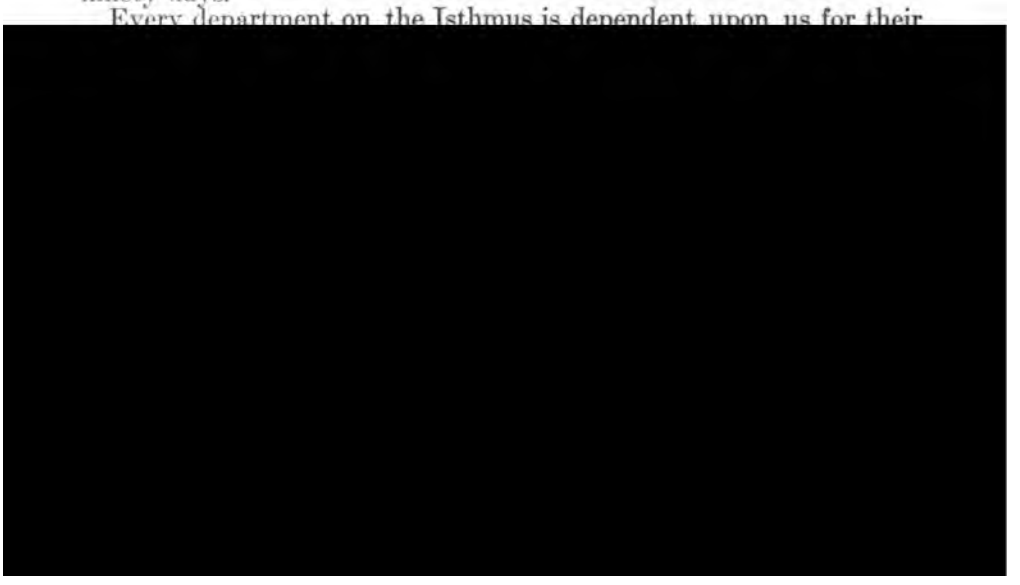
The diversity of work found in the construction of the Panama Canal necessitates the purchase and use of an almost endless variety of equipment, material for repairs, and small supplies for maintenance.

It has been necessary to purchase rails and other track material, locomotives, cars, steam shovels, cranes, pile drivers, drills, unloaders,

earth spreaders, and other equipment for the physical work of excavation, and the disposition of the excavated material; lumber, roofing, hardware, plumbing, and all classes of building material for the construction, repair, and maintenance of gold and silver quarters, shops, storehouses, oil houses, hospitals, hotels, laborers' kitchens, penitentiaries, jails, post-offices, office buildings, clubhouses, cold storage and ice plants, laundry, bakeries, etc.; equipment, appliances, medicines, drugs, etc., for hospitals, dispensaries, and sick camps; machinery, tools, and supplies for shops, planing mills, foundries, round houses, etc.; equipment and supplies for the police and fire departments; furniture, dishes, and equipment for gold and silver quarters, hotels and laborers' kitchens; track material and tools for the construction, repair, and maintenance of tracks; animals, vehicles, forage, and corral supplies for local transportation; stone crushers, rollers, cement, sewer and water pipe, brick, and other materials for the use of the division of municipal engineering; dredges, tugs, lighters, barges, and other floating equipment for the marine work; and numberless other items used in connection with the operation, repair, and maintenance and equipment named, together with a supply of standard materials and supplies in stock at the various storehouses for the shops and for the use of all the different departments on the Isthmus.

These supplies consist of repair parts for locomotives, steam shovels, cars, drills, and other equipment and machinery; small tools for the shops; iron, steel, builders' hardware, plumbing material, furniture, marine supplies, track tools, paints and oils, foundry supplies, corral equipment and supplies, stationery and printed forms, and a great number of other articles that are constantly required by all branches of the work. We aim to limit our supply of standard material to approximately six months' requirements—this by reason of the length of time it requires, from date of requisition, to advertise, award, ship, and receive the material on the Isthmus—although many articles of standard supplies, such as oil, waste, lumber, roofing, track tools, nails, cement, etc., are "turned over" in from thirty to ninety days.

Every department on the Isthmus is dependent upon us for their



By reason of this record the storekeepers can keep a line on the consumption of various materials from month to month, and their stock orders are based upon the consumption as shown on their stock books.

The division of material and supplies as now organized is handling the immense amount of business required of it in an efficient and businesslike manner, and works in harmony with all other departments and in the interest of the Government in connection with the great work of constructing the Panama Canal.

The health conditions of the employees of this division during the past fiscal year have been exceptionally good. There have been no deaths among the white employees and very few cases of illness.

I have the honor to be, yours, very respectfully,

W. G. TUBBY,
Chief, Division of Material and Supplies.

Col. GEO. W. GOETHALS,
Chairman and Chief Engineer, Culebra, Canal Zone.

APPENDIX E.

REPORT ON THE GEOLOGY OF THE CANAL ZONE.

ISTHMIAN CANAL COMMISSION,
Washington Office, June 26, 1907.

SIR: I have the honor to transmit herewith my final report on the geology of the Canal Zone. A copy of the report has been sent to the honorable the Secretary of War.

Very respectfully,

ERNEST HOWE,
Geologist.

The CHIEF ENGINEER, ISTHMIAN CANAL COMMISSION,
Culebra, Canal Zone.

INTRODUCTION.

In the following description of the geology of that portion of the Isthmus of Panama traversed by the Panama Canal an effort has been made to confine the discussion to matters of general interest and to describe such features as have special bearing on the problem of canal construction. Many details and theories of interest only to specialists have been purposely omitted, since the objects of the survey were primarily practical ones and were intended to supply information in regard to the character of the sites selected for locks and dams, and to obtain some idea as to the natural resources of the country and especially in regard to building materials.

In the course of the survey data of considerable scientific value were obtained that, it is believed, will throw light on a number of

extend from Limon Bay nearly to Bohio. This division ends near San Pablo, about 6 miles below the point where the Rio Obispo enters the Chagres. The second division is that of the summit region, and extends from San Pablo to Pedro Miguel, while the third lies between Pedro Miguel and La Boca, and, like the first, is generally low and swampy.

The Caribbean slope.—East and south of Limon Bay, a swamp, whose elevation is little above that of the sea, extends backward for 2 miles or so from the shore. Low hills, hardly continuous enough to be called a range, lie directly back of Colon and the bay; they are the Monkey Hills, near Colon, while to the southwest they are known as the Mindi Hills. Their summits are extremely uniform in height, rising about 50 feet above the level of the swamps. These hills have an important bearing on the physiographic development of the region, and are referred to later under the heading, "Development of the present topography."

Forming a crescent-shaped boundary between the littoral swamps and the basin of the Chagres Valley and its tributaries, the Gatuncillo and Trinidad, is a well-defined range of hills, over 100 feet in elevation, that extends from the coast east of Colon to a point some miles west of Limon Bay, the continuity of the hills being broken only where the Chagres River has cut a broad passage through them at Gatun. From this point southeast the valley, dotted with low conical or rounded hills which rise from swampy alluvial flats, gradually becomes narrower until, near San Pablo, the lowlands cease and the hilly portion of the Isthmus begins.

The Central region.—The second topographic division includes that portion of the Chagres Valley that lies between San Pablo and Matachin, the valley of the Obispo to near its head at Culebra, and, on the Pacific Slope, the valley of the Rio Grande to Pedro Miguel, a total distance of about 16 miles. The region is one of rounded or conical hills 500 to 1,000 feet in elevation that are without systematic arrangement in chains or groups. From San Pablo to Obispo the valley is comparatively open, but at the latter point the Chagres is left by the line of the canal and the valley of the Obispo followed. In its lower part between Las Cascadas and Bas Obispo the valley is narrow and hemmed in by hills. Just south of Las Cascadas there is an open basin, which, between Empire and Culebra, has a width of more than a mile; it is surrounded by lofty hills and has a minimum elevation of about 200 feet. South of the continental divide at Culebra there is a rapid descent with a widening of the valley of the Rio Grande to Pedro Miguel, where the stream is joined by several tributaries.

The Pacific slope.—The expansion of the valley at Pedro Miguel marks the beginning of the third topographic division. With the development of flood plains in the lower valley of the Rio Grande swampy conditions comparable to those on the Atlantic exist, but to the northeast and southwest of the valley the hilly topography of the central portion continues quite to the sea, while several isolated hills rise from the floor of the valley to elevations of from 300 to 500 feet. At the point where the stream enters the Pacific at La Boca, the valley is hemmed in by Ancon and Sosa hills on the east and on the west by the southern extension of central uplands, so that it has the form of a broad open basin, with a narrow outlet to the Pacific.

It will be shown in discussing the geology of the region that there is a close relationship between the geology and the topography, and that most of the differences in the topography which are encountered in crossing from one side of the Isthmus to the other are to be attributed very largely to the character of the underlying formations.

GEOLOGY.

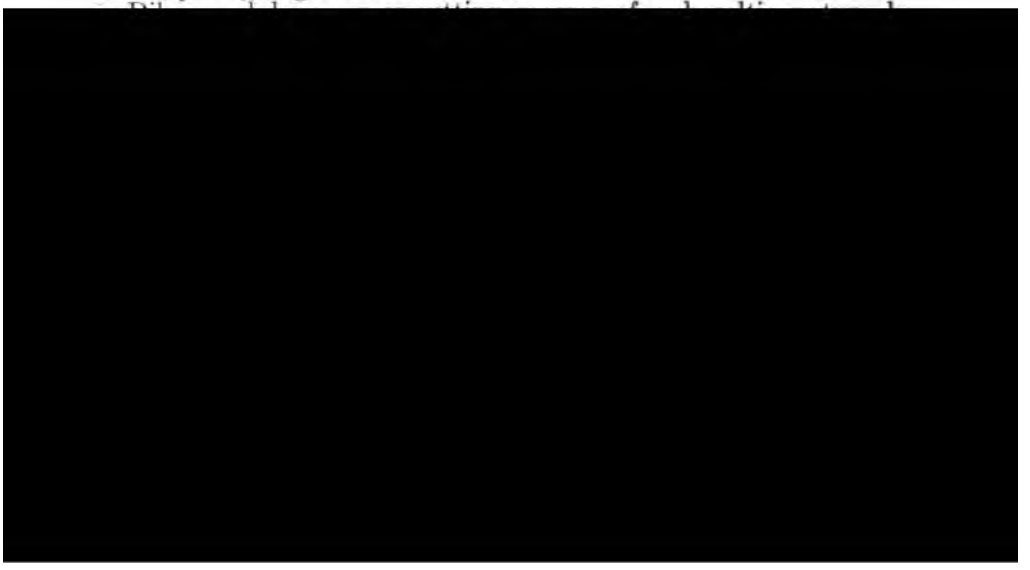
INTRODUCTION.

From surface outcrops, borings and exposures made by excavation for the canal and the Panama Railroad, it is possible to obtain a clear idea of the broader features of the geology of the Canal Zone. Most of the points concerning which there may be some uncertainty are of minor importance and have no direct bearing on the problems of canal construction.

Before taking up detailed descriptions, it will be well to consider briefly the different formations that have been recognized, and their relations to one another.

The central portion of the Isthmus along the canal line consists of rocks of igneous origin. They are the oldest rocks of the region and have been observed at the surface in the central area, between Mamei and Empire and northeast of the city of Panama; diamond drill borings have indicated their presence also at other points, and it is believed that they underlie at greater or less depth the whole territory included in the Canal Zone.

To the northwest younger rocks of sedimentary origin occur, resting on the older igneous mass, and gently inclined toward the Caribbean Sea, so that in passing from the interior toward Colon successively younger beds are encountered. Their well-defined stratification and the abundant fossil remains of marine organisms indicate that these rocks were formed by the deposition of gravel, sand, and mud on the sea bottom, or in tidal estuaries where the materials gradually hardened into rock. Nearly the same conditions prevail on the Pacific side, where, in addition to the older igneous and sedimentary rocks, younger igneous rocks occur.



rocks of various sizes, from that of fine gravel to blocks 1 foot or more in diameter. In the case of a volcanic breccia the cement usually consists of finer material of the same composition as the included fragments. Breccias such as those that make up a large part of the Obispo formation are the result of volcanic eruptions of explosive violence, by which great quantities of volcanic "ash," lapilli, and large and small blocks of igneous rock are hurled from the throat of the volcano and deposited either on the surface of the adjoining land or laid down in sea or lake basins. In such eruptions the finer material thrown out has been thoroughly calcined by the heat of the volcano and subsequently triturated by the force of the explosion, so that it possesses the properties of a natural hydraulic cement and needs only a little moisture to set and bind the ejected material into a solid rock.

The Obispo breccias, which are believed to constitute a large part of the formation, are of variable texture, usually being composed of angular fragments an inch or more in diameter. No evidence was found that they were laid down or sorted by the action of running water. The fragments consist of andesite of a variety of textures and show slight differences in composition. The majority of the fragments appear to consist of pyroxene-andesite, although a fair percentage of hornblende-andesites are present. The color of the breccia on fresh exposures is a dark blue or green. The rock near the surface has been altered to a red clay.

At a few places, notably in the vicinity of Empire, lava flows of massive andesite were found associated with the breccias. The actual relation of the flows to the breccias is not clearly shown, but it is believed that they were contemporaneous and that quiet outpourings of lava alternated with the explosive eruptions that produced the breccias. The massive rock is of essentially the same composition as that composing many of the fragments in the breccias, but in most cases is too far decomposed to admit of exact determinations.

Occurrence of the Obispo formation.—As was said in the introductory paragraph, it is believed that the Obispo formation underlies all of the Isthmian region, or at least so much as is included within the Canal Zone. It may be traced almost continuously from south of Empire to Mamei, while borings in the vicinity of San Pablo show that it is only a few feet below the surface at that locality. North of this point younger formations occur, and if the Obispo rocks are present they are deeply buried beneath the cover of later sediments. South of Empire the breccias disappear beneath the thick cover of the Culebra formation, to be described later.

Rocks of the same character occur in the hills northeast of Corozal and to the east of the city of Panama, in the vicinity of Las Sabanas. Although the relation of these rocks to the acid pyroclastics of the region is not clearly shown, it is believed that the andesitic breccias are older and that they are a part of the Obispo formation.

The thickness and east and west extension of this formation is absolutely unknown. Borings in the vicinity of Empire passed through 200 feet of the breccia and did not encounter any other kind of rock. Formations of similar character in the Rocky Mountain region of the United States have observed thicknesses of from 2,000 to 4,000 feet.

Judging from the extremely unconformable relations that exist between the Obispo formation and the younger rocks, it seems clear that following the eruption of the breccias the region was thoroughly dissected by the erosive action of streams. The interval between the close of the andesitic eruptions and the beginning of the next recorded epoch was of unknown extent, and the original surfaces of the Obispo rocks were completely obliterated before the next succeeding formation—the Bohio—was deposited.

BOHIO FORMATION.

Probably the oldest sedimentary formation represented in the Zone is that which has its most characteristic outcrops in the vicinity of Bohio.

Character of the rock.—Near the railroad station is a cliff, from which building stone has been quarried and which rises 50 feet or so from the level of the flat on which the town is built. The rock here is of a very even texture and at first glance strongly suggests a fine-grained volcanic breccia. It is of a peculiar brownish color, unlike that of the Obispo breccia; the fragments are apparently angular and usually less than 1 inch in diameter. One of the most striking features of this rock, shown in deep borings as well as at surface outcrops, is its alteration; it mashes under a blow of the hammer, and yet has not the appearance of being greatly decomposed, except at or very near the surface. The alteration seems to have been to serpentine or some related mineral instead of kaolin, as is usually the case with the other rocks, especially those of the Obispo formation.

Across the river, at the old lock site south of Bohio and east of Peña Blanca, quite a different phase of this formation is exposed; it consists of alternating layers of sandstones and course conglomerates all clearly water transported and deposited. Many of the bowlders are a foot or more in diameter; they are of andesites for the most part, but not a few are of a lighter colored porphyritic rock with abundant hornblende crystals. The finer layers and the cementing material are very like the rock occurring at the Bohio quarries. Crossbedding is common and fine material often occurs in lenses in the grits and conglomerates. The prevailing strike is N. 25 E., and

position of the materials being fairly uniform. It is not improbable that volcanic eruptions may have been taking place during the period in which the formation was deposited and the material forming the breccia-like portion attributed directly to such a source.

Age of the formation.—The fossils previously referred to that were found in the core taken from hole 24–b occur at elevations of from 30 to 40 feet below sea level. They include, in addition to vegetable matter, certain fossils indicating probable Eocene age. At about 2 miles to the west at a locality known as Vamos Vamos, on the left bank of the French canal, are outcrops of a limy shale with large calcareous concretions resembling bowlders in a conglomerate; both the shale and concretions contain numerous fossils which Dr. William H. Dall regards as of undoubted Eocene age. Outcrops of similar rock containing the same fossils occur about 6 miles to the northwest on the left bank of the canal in the vicinity of Gatun.

The rocks at Vamos Vamos and in the vicinity of Gatun are finer grained than those of the Bohio formation and consist of shales and fine sandstones

The fossil evidence shows with certainty that the beds near Gatun and at Vamos Vamos and Bohio are of the same age, and it is believed that they are to be regarded strictly as part of one formation, the occurrence at Bohio representing a littoral facies, while those farther to the northwest were deposited in deeper water.

MARLS OF PEÑA BLANCA.

In the excavations made by the French between Bohio and Peña Blanca, and also at the base of a little hill at the west end of the village of Bohio, there are outcrops of a white calcareous sandstone or marl containing some volcanic material in the form of crystals of feldspar and fine specks of a ferromagnesian mineral. In places it is extremely rich in the remains of foraminifera, especially *Orbitoides fortisi*, and may seem to consist altogether of the shells of these minute organisms.

The points where these rocks are found lie between the occurrences of Bohio rock at Bohio and Vamos Vamos, but the true relations between these two formations are unknown since they have been found nowhere in contact. R. T. Hill states that he has found them in unconformable contact at the river's edge near Bohio, but this locality I have been unable to identify.

The foraminifera of the Peña Blanca rocks, and especially the species *Orbitoides fortisi*, are characteristic of the Lower Oligocene. From their position between two well-determined occurrences of Eocene rocks it is believed that they are clearly younger than the Bohio formation and rest upon these rocks unconformably.

GATUN FORMATION.

Directly above a conglomerate that occurs near the railroad station at Gatun is a brownish, impure calcareous clay or argillaceous sandstone, apparently containing much débris of volcanic rocks and numerous fragments of shells. Many perfect fossils are to be found, but the extremely crumbling nature of the rock makes it almost impossible to obtain good specimens. Such as were collected have been determined

by Doctor Dall as of probable Oligocene age and newer than the foraminiferal beds of Peña Blanca, and the rocks are to be regarded as near the base of the succeeding Oligocene formations that occur at numerous places between Gatun and the bay, notably at the Mindi Hills and at the Monkey Hills.

The conglomerate under these sandstones contains many fossils that are the same as those of the Bohio and Vamos Vamos beds, but it is believed that the conglomerate represents the base of the Gatun formation and that the Eocene fossils present were derived from the older rocks and so do not indicate the true age of the conglomerate.

Outcrops are not numerous in the vicinity of Gatun, but the great number of borings that have been made in the neighborhood in exploring for lock sites supply much information in regard to the character of these younger beds, which for convenience may be referred to as the Gatun formation. They are appreciably different from the rocks of the Bohio formation, whether occurring at Bohio itself or in the more distant localities.

Soft sandstones of a dirty greenish-gray color, derived from igneous rocks with a calcareous and clayey cement, are the most abundant rocks of the Gatun formation. Associated with them are shales, impure marls, greensands, and, at certain horizons, fine white tuffs composed of pumice, probably of the composition of a rhyolite, concerning which more will be said in a later section. The rocks are all well consolidated, though in a few rare cases sandy layers are found which crumble on exposure to the air. These are the beds that have been referred to frequently as "indurated clays." The term is a misleading one, since true clays make up but a small part of the formation. Induration is a term applied to the process by which sandstones or argillaceous rocks are converted into quartzites or slates by heat or mineralized solutions accompanying the intrusion of igneous rocks. None of these conditions existed in the vicinity of Gatun. The rocks are of sedimentary origin and were deposited on the sea bottom at some distance from the shore in the form of sands and clays. Their subsequent hardening into rock is the result of simple cementation by calcareous solutions contained in the sea water and through pressure. Certain beds are harder than others,

Empire, Las Cascadas, and in the railroad cut between these two places, are also indicated at several points by borings. Of these the occurrences at Empire (Camacho) are undoubtedly the most massive, the others being present apparently as lenses in the shales and sandstones. Although some thick beds of very homogeneous pure clay shales occur, most of the formation is richly carbonaceous, and at a number of places in the cut lens-like seams of lignite have been found and remains of trees and plants are abundant.

The age of the Culebra formation can not be fixed with absolute certainty. Fossils collected at a number of points between Las Cascadas and Pedro Miguel were not sufficiently characteristic to determine the age of the beds, but at the lock site at Pedro Miguel collections were made at two points less than 100 yards apart that supply more definite information. The fossils from the more northerly point, 30 feet vertically above the other horizon, are regarded by Dall as representing the Oligocene, probably a reef deposit. The material from the lower and more southerly locality is pronounced Eocene by Dall. From the prevailing southerly dip of the beds in the region the fossils from the two localities were believed in the field to belong to the same horizon. The lack of continuous outcrops, however, makes it impossible to assert positively that this is so. The only fossils collected by Hill from the Culebra formation came from the Empire limestone. Only the foraminiferal portion seems to have been determined, and these are regarded by Bagg as probably Eocene. The fossiliferous beds near Pedro Miguel are undoubtedly at or very near the top of the formation, since the dip carries them below the surface a short distance to the south, and borings at kilometer 59, slightly to the north, show the usual Culebra formation extending to an unknown depth below. The Eocene and Oligocene ages of the beds at the two localities at Pedro Miguel seem certain. In any event there can be little doubt of the Eocene age of the Culebra formation as a whole and its probable correlation with the Bohio and Vamos Vamos beds. The occurrence of an Oligocene fauna directly above the characteristic Eocene at Pedro Miguel is comparable to the sudden change that takes place at Gatun from the Eocene of the Vamos Vamos beds to the Oligocene of the Gatun formation.

The thickness of the Culebra formation has been variously estimated at from 400 to 500 feet. A boring made at kilometer 55 of the canal (hole 31) extends 40 feet below sea level, starting at 167 feet above the sea; 207 feet of Culebra beds are here indicated, while possibly 175 feet might be added as representing the part already excavated at the cut, giving a thickness of nearly 400 feet, with the bottom not yet shown.

Practically continuous outcrops may be found for a distance of 7 miles along the line of the canal from the vicinity of Las Cascadas to Pedro Miguel, but it is only from kilometer 53 southward that the great thickness of the beds occurs. At kilometer 53 a diamond-drill boring passed through the andesite breccias of the Obispo formation all the way, no trace of the Culebra being found, although it does occur at higher elevations on both sides of the canal cut.

Southward the Culebra formation may be traced on the surface or by borings to Pedro Miguel. The last boring records are at kilometers 58 and 59. Good outcrops occur, as has been said, about a third of a mile southeast of the point where the railroad crosses the

canal line near Pedro Miguel; south of this point no outcrops were found, but there can be no doubt that the beds continue for some distance farther, the general dip being moderate, and to the east of south, complicated by local deformations. Borings at the sites for the La Boca and Sosa-Corozal dams have shown the presence of sandy shales at depths of 70 feet or more below mean tide. Lithologically they are the same as many that occur at different horizons in the Culebra formation.

At several points in the 7 miles of outcrop, sharp deformation, crumpling and local faulting have been observed in the Culebra beds; in general the formation has a moderate inclination to the south.

The presence of lignite and carbonaceous clays back of Frijoles and Tabernilla and the limestones on the upper Chagres suggest that an actual connection may exist between the Culebra beds and the Bohio formation, but it has not yet been observed.

UPPER LIMITS OF OLDER SEDIMENTS.

No well-marked upper limit to any of these beds, the Culebra, Bohio, Vamos Vamos, etc., has been found. The *Orbitoides* beds would seem to be slightly younger than the Bohio formation, but the contact apparently is an unconformable one, so that nothing definite can be learned from this. The fossil evidence, according to Doctor Dall, indicates that the *Orbitoides* beds are slightly younger than the Vamos Vamos, while at Gatun the beds immediately overlying the conglomerate containing fossils of Vamos Vamos age are pronounced by Dall to be Oligocene and probably younger than the *Orbitoides* marls. Very similar conditions seem to exist on the Pacific side. As has been said, the Culebra formation was traced as far as Pedro Miguel; here the beds have a moderate but persistent dip southward, but exposures cease about at the point where the canal line crosses the Rio Grande. It is here that the two horizons occur from which Eocene and Oligocene fossils were collected. The next outcrops to the southeast are at Miraflores, and their situation strongly suggests that they are of rocks stratigraphically above the Culebra.

are to the southwest. Associated with the tuffs at the most westerly exposures are flows of massive rhyolite and dikes of the same rock occur in the vicinity of Gabilan, cutting the tuffs. The direction of the dikes is in all cases toward the summit of Ancon Hill. The whole of Ancon Hill itself consists of massive rhyolite porphyry. Northwest of the hill is a swamp in which there are no outcrops, but directly north of the hill the same tuffs are to be seen at a number of points in the railroad cuttings, and although much altered their structure is fairly well preserved and the dips are at low angles to the north. The more distant exposures at Corozal and Miraflores have variable dips to the north or southeast.

Taking these facts into consideration, although the evidence is far from complete, they would seem to indicate that Ancon Hill marks the source of the tuffs, and that the rhyolite composing it represents the final phase of eruption and that lavas choked the vent. In other words, Ancon Hill is to be regarded as the throat of an old volcano, and the beds of tuff sloping away from it in all directions represent the fragmental material thrown out from the volcano in the early stages of its existence.

These tuffs are the ones that Hill has described as the Panama formation. He considered them of Cretaceous age, and the oldest rocks exposed on the Isthmus. He makes no mention of the fossil locality near Pedro Miguel. Bertrand reports that near Pedro Miguel and Corozal borings show the presence of the fossiliferous part of the Culebra beneath the acid tuffs. Unfortunately it has been impossible to find any boring records in this vicinity, but the field relations seem to justify the acceptance of Bertrand's statement.

Borings made at the site of La Boca dam, after passing through sandy shales that are believed to belong to the Culebra beds, showed at a number of points rhyolite porphyry like that of Ancon Hill and apparently in the form of dikes cutting the shales.

The relations of the Pacific side, therefore, seem to indicate that the acid tuffs and breccias are younger than the Culebra formation, but whether or not they follow it conformably it is impossible to say.

On the Caribbean side beds similar to those of Corozal and Miraflores occur at San Pablo and are well exposed at the point where the Panama Railroad crosses the Chagres. The lithologic identity of these beds with those on the Pacific slope can not be doubted, but their relation to the sedimentary rocks at Bohio and Vamos Vamos is not shown directly.

Borings at San Pablo show that in this vicinity the acid tuffs are underlain by the andesitic breccias of the Obispo formation, but the absence of the Bohio formation has little significance. A hint as to the actual age of these tuffs was found in examining the borings at Gatun. In holes 438 and 377 made near the lock site, at elevations slightly below sea level, soft white rhyolite pumice tuff is indicated in the core. It is in some cases of a dirty white color with crystals of hornblende and orthoclase abundant. In hole 438 the tuff, compact in some places and crumbling at others, is composed of very fine particles of volcanic glass or pumice. The purity of this material shows that it can not have been transported by water, and its sharp unaltered glassy character strongly suggests that it is the direct deposit of volcanic material of the finer sort often referred to as "ash," and that it fell after eruption into the sea at some distance

from the vent, later settling to the bottom. These tuffs are clearly interbedded with the sandstones of the Gatun formation of Oligocene age. Without further information on the subject these facts would seem to indicate eruptions of rhyolite or trachyte during the Gatun epoch. The character of the material and its texture suggests that it was deposited in water at some distance from its source. Just where the source was is unknown, but it is probable that the tuff deposits of the Pacific and Atlantic sides were derived from more than one center of eruption.

A rock related to the rhyolite porphyry of Ancon Hill composes the islands of Naos and Culebra in Panama Bay. It contains a relatively large amount of plagioclase feldspar, in addition to quartz and orthoclase, which occur abundantly in the groundmass. From field relations it is impossible to say whether the rock is part of a surface flow or an intrusive body, but the crystalline character of the groundmass indicates that it is probably an intrusive.

An intrusive sheet of similar rock has been exposed on both sides of the Culebra Cut directly north of Gold Hill. Whether or not sedimentation continued from the time the Oligocene beds at Gatun were deposited until the youngest rocks, the impure shales and marls that occur at Monkey Hill, is unknown, but it is believed that no break occurred. The Monkey Hill beds are considered by Dall to belong to the middle or upper Oligocene.

INTRUSIONS OF BASIC ROCKS.

Occurrence.—At some time later than that in which the rhyolite tuffs were deposited, eruptions or intrusions of basic rocks took place in the Isthmian region. These rocks are prominent from the Pacific to the Culebra district at least; their presence northward is more than probable. It is difficult, and in many cases absolutely impossible, to determine the form and nature of these masses of basalt or andesite. Wherever they have been exposed in the canal excavation or railroad cutting they appear clearly as intrusives. Their presence seems to be indicated in many of the hills flanking the canal line in the summit region, but except where fairly deep excavations

the clays of the Culebra formation, while still more to the south in the La Boca region they cut the acid tuffs. How much younger they may be is not known, but it is probable that they marked the termination of active volcanism in the Zone at least, and were either contemporaneous with or immediately followed the close of Tertiary sedimentation.

At Porto Bello, some 18 miles east of Colon, on the Caribbean, rocks of essentially the same character occur at the edge of the sea.

Petrographic character.—The majority of the rocks that have been described as "basic" are augite-or hypersthene augite-andesites. Some, especially in the vicinity of the Culebra cut, are more basic, and are to be regarded as basalts; in a few cases they were found to contain olivine. They are in most cases very fine textured, and, when fresh, nearly black.

DEVELOPMENT OF THE PRESENT TOPOGRAPHY.

The events that followed and resulted in the development of the present topographic features must be referred in part at least to the close of the Tertiary, since the next fossils observed are shells of Pleistocene age occurring in deposits laid down after more than one partial cycle of erosion.

The beginning of the period of basic intrusions probably marked the close of sedimentation in Tertiary time, and it is believed that these events took place in the Miocene.

Various epeirogenic movements and minor folding and faulting, that are recorded in the present topography and geology, took place at this time, and were undoubtedly closely related to the intrusions of basic igneous rocks and larger masses of granular rocks that marked the close of the Tertiary.

Long after the period of intrusion had ceased, a general upward movement of the land with respect to sea level continued until nearly all of the Tertiary sediments were raised above the surface of the oceans. A condition of equilibrium was eventually reached and a long period of erosion began, which resulted in the degradation of the land to such an extent that the rugged topography that is believed to have existed at the time of the maximum uplift was subdued and the region became one of low, rolling hills in the central portion, bordered on the Atlantic and Pacific sides by broad plains whose surfaces were only a few feet above sea level. Across these plains rivers, flowing from the interior, meandered sluggishly. Remnants of this old base-leveled surface may be seen to-day in the level summits of the Monkey Hills near Colon and, to a less marked degree, at a number of points on the Pacific side. At this time it is believed that the Chagres River entered the Caribbean Sea at the point now marked by Limon Bay.

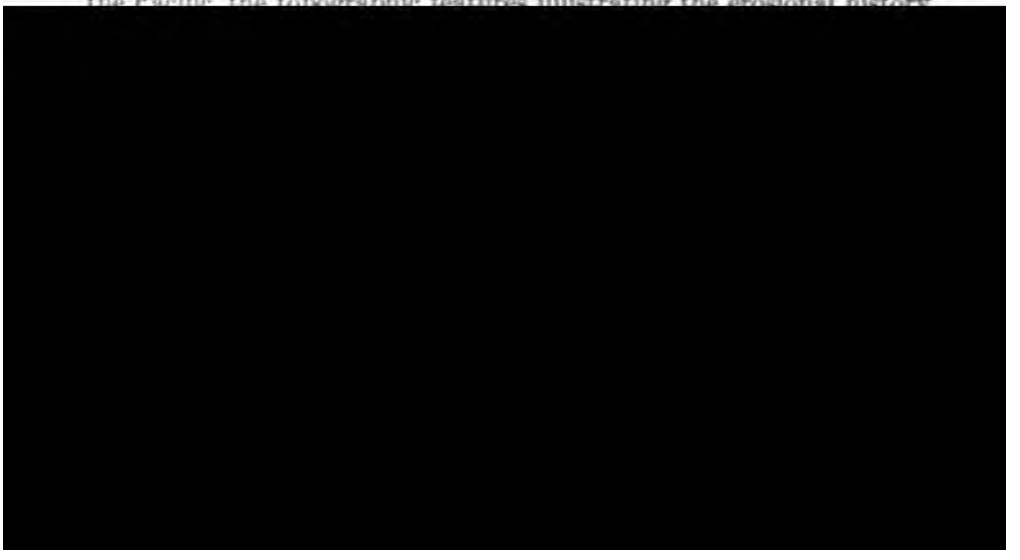
Following this period, in which little or no erosion was taking place, and streams meandered on flood plains far back from their mouths, the land was again elevated for about 50 feet near the coast and probably to a greater extent in the interior. As a result of this uplift the activities of the streams were revived, and new valleys were cut in the surface of the peneplain. The erosion resulting from this uplift continued long enough to develop wide, open valleys and almost obliterated all traces of the old surface. It was at this time that a small stream, entering the sea near the present mouth of the Chagres,

by vigorous headward erosion cut through the low divide that separated it from the Chagres and diverted the lower waters of the larger stream to its own channel, through which they have since continued to flow.

Before the streams succeeded in reducing the land a second time to a condition of base level, a third uplift occurred by which the land was elevated over 300 feet above its earlier position. The streams at once intrenched themselves in their old channels and cut deep and narrow valleys, almost canyon-like in character, far below their former flood plains, but before open valleys could be formed the land began to sink gradually, and the streams, with their velocity and carrying power checked near their mouths, aggraded their channels. The general subsidence continued until the intermediate level, or terrace, near Colon was submerged 10 feet or more below the sea. The deep valleys of the large streams were filled with alluvium, and shallow lagoons or estuaries extended inland from the sea for a number of miles. The clays and silts that underlie the swamps near Colon were deposited at this time, and the shells contained in them indicate that the events took place in the Pleistocene. A slight upward movement of the land has raised these silts and clays a few feet above tide level. Since then, or perhaps during the last uplift, wave action has accomplished the removal of a large part of such materials that probably filled what is now Limon Bay.

Although the preceding description has confined itself to the lower Chagres Valley, precisely the same conditions exist on the Pacific side of the Isthmus. A terrace or bench comparable to the Monkey Hill level may be recognized at many points in the vicinity of Panama and La Boca and in the islands of the bay. The floor of the Rio Grande Valley, although less extensive than that of the lower Chagres, corresponds to the lower or Colon level and, as on the Caribbean side, soundings in Panama Bay suggest the seaward extension of this second level. Borings in the vicinity of La Boca have developed cross sections of the Rio Grande that correspond to those of the Chagres, and indicate an older and deeper channel now filled with sedimentary material.

On approaching the central portion, both from the Caribbean and the Pacific, the topographic features illustrating the erosional history



From San Pablo southward the Obisbo breccias and later andesitic intrusives are the prevailing rocks; they are hard and massive, and the topography is correspondingly rugged.

The presence of the Culebra clays is marked by the open valley or basin of the upper Rio Obispo, and where eminences occur, as at Empire and Culebra, they are found to be due to intrusive masses of andesite or basalt.

On the Pacific slope the occurrence of basic intrusive rocks in the rhyolite tuffs is characteristically shown at Aguadulce and Sosa Hills that rise abruptly from the plain eroded by the Rio Grande in the softer rhyolite tuffs, or shales of the Culebra beds.

PART II.

APPLIED GEOLOGY.

The relation of the Isthmian geology to the varied problems of canal construction is, in all cases, intimate. One of the problems that is closely connected with the geology is that of the excavation of the cut in the central area. Actual work has advanced so far in this region, however, that geology can add little to the practical information acquired in the course of the excavation that has already been made. A less evident, but perhaps closer, relationship exists between the geology and the problems attendant upon the construction of the locks and dams, while the necessity of obtaining large quantities of building material near the points where locks and regulating works are to be constructed calls for a special study.

EXCAVATION.

In estimates for excavation, and in studies of foundations for masonry structures, materials are usually placed in one of three groups—earth, soft rock, and hard rock. This grouping is, of course, arbitrary, but from long practice the divisions have come to be fairly well defined. In this report the following distinctions will be recognized:

Earth includes soil, alluvium—such as clay, sand, and gravel—and clays of decomposition, in which all traces of the original structure of the rocks from which they were derived have been lost.

Soft rock is usually understood to mean material that is more or less consolidated but still soft enough to be handled with picks or steam shovels. A distinction should be made between such rocks as are naturally soft and those that have become soft as a result of decomposition. The rocks of all humid tropical regions are generally much altered near the surface, certain rocks being more readily decomposed than others. The basic igneous rocks, rich in the plagioclase feldspars and ferro-magnesian silicates are especially subject to this surface decay, and yield plastic red clays that grade downward to the firm unaltered rocks from which they were derived. The presence of this layer of clay of decomposition over nearly all of the Isthmian region makes it extremely difficult in many places to classify the materials. At the surface the clays mixed with vegetable remains are comparatively soft and loamy and would most naturally be regarded as earth. Below this layer of soil the red and yellow clays may extend downward for 50 feet or more, often grading *imperceptibly into* the hard undecomposed rock. These red and

yellow clays are frequently referred to as soft rock; a better term would be "decomposed rock," reserving the term "soft rock" for the more or less consolidated rocks of fragmental character, whether of sedimentary or volcanic origin, that have not necessarily undergone decomposition. The line between the red or yellow clays, grouped as earth, and the decomposed rock, is necessarily an indefinite one.

Hard rock implies that the material is too tough and hard for picks or steam shovels to make any impression on it, and that blasting is in all cases necessary.

In the following table the rocks belonging to the different formations that have been described in the first part of this report are grouped according to this classification:

Classification of materials.

Kind of material.	Character.	Formations represented.
Earth	Soil; alluvial clay, sand, and gravel; residual plastic clays resulting from the decomposition of rock in place.	Pleistocene and recent stream deposits; soil; and "red clay."
Soft rock	Soft or weakly consolidated marls, shales, sandstones, conglomerates, rhyolite tuff.	Parts of Bohio, Culebra, and Gatun formations; acid tuffs of San Pablo and Corozal.
Hard rock	Breccias, tuffs, and massive igneous rock, sandstones, conglomerates, limestones.	Obispo formation; acid tuffs (fresh) of Miraflores, Corozal, and San Pablo; rhyolite of Ancon Hill; intrusive andesites and basalts; certain horizons of Bohio and Gatun formations; limestones of Culebra formation.
Decomposed rock	Red and yellow gritty clays containing residual fragments or rounded masses of the unaltered rocks from which they were derived.	Overlie most of the solid rocks of the region to depths of from 5 to 50 feet; basic igneous rocks more subject to decomposition than acid rocks, andesite breccias more profoundly altered than massive rocks of the same composition; sediments composed of the detritus of igneous rocks.

Information at hand from recent exposures and borings in the central region supplies very definite knowledge as to the nature of the materials to be encountered in excavating the prism between Bas Obispo and Pedro Miguel, and the description of the character of these rocks given in the first part of this report may be summarized here.

tural break. Several small faults do occur in the Culebra beds between Culebra and Empire, and cross the canal in an east and west direction; they will have no effect on excavation nor upon the stability of the slopes; with increased depth there will be little change in the hardness of the Culebra beds; they are to be classified as soft rock and should be easily handled by steam shovels to the desired depth if broken up by blasting.

The physical character of the Culebra beds, consisting as they do of alternating layers of sandstone and shale, is peculiarly favorable to landslides. Structurally, however, the strata are so nearly horizontal, or have such low southerly dips north of Gold Hill, that movements involving large masses of rock are improbable, while slopes of suitable angles will do away with the danger of minor slips.

Gold Hill is bounded on the north and south by faults, the mass of the hill having sunk with respect to the rocks on the other sides of the faults. During the process of faulting the strata were twisted to the eastward, and now have steep dips in that direction. This structure is also complicated by large masses of intrusive basalt which were included in the Culebra beds prior to the faulting. The induration resulting from these intrusions has been so extensive that all the rocks in Gold Hill are now very hard and firm, and with the sedimentary beds dipping into the hill the conditions are such that landslides are most unlikely to occur.

In Contractors Hill a heavy breccia member of the Culebra beds dips in the direction of the cut. It is believed that the soft Culebra beds will be encountered below the breccias. If these beds are found to have strong northeasterly dips—that is, if they are inclined in the direction of the cut, as the surface indications suggest—it will be necessary to make comparatively low slopes on the southwest side of the canal at Contractors Hill in order to avoid any possibility of landslides. This is the only point along the canal where such movements are at all possible. In my opinion the danger is not serious, but ordinary prudence requires that, if the soft Culebra beds are found beneath the breccias to dip at angles of more than 15° in the direction of the cut, the angle of slope be so reduced as to do away with all danger of slipping.

Between Gold Hill and Cucuracha, on the northeast side of the cut, landslides have taken place frequently in the rainy season. The materials involved in these slides are purely superficial; in some cases French spoil banks have slipped. The cause in all cases seems to be the saturation of the unconsolidated surface material and its movement on layers of slippery clays either in the Culebra beds or residual clays upon which spoil was dumped. The basin south and east of Gold Hill collects large quantities of water during the rainy season, and this escapes through no well-defined drainage, but in springs along the edge of the cut. In some cases surface soils or even the rock of the Culebra formation may take place in these landslips. They are not serious, however, and although they may continue in a minor degree for a number of years, the removal of the material before it reaches the edge of the cut and the gradual reduction of the slopes back of the cut will stop this trouble. The French attempted an elaborate system of drainage to overcome the difficulty, but this has been proven entirely inadequate, and it is improbable that any system of this sort would be practical or economical.

GEOLOGY OF THE DAM AND LOCK SITE.

GATUN.

Introduction.—At Gatun the sides of the broad lower valley of the Chagres converge and the stream passes through a gap in the Sierra Quebrancha a little over 1 mile wide. These hills trend northeast from Gatun in a well-defined chain. On the southwest side of the river the range widens and extends south and west as a hilly region between the Trinidad drainage and the sea, with a divide near the Trinidad River. From Bohio northwest the whole region is one of young sedimentary rocks and the wide and open character of the Chagres, Trinidad, and Gatuncillo valleys is due to the ease with which these rocks have been eroded. Younger and slightly harder rocks have been preserved in the hills bordering the lower part of the valley, and it is of these that the Sierra Quebrancha is composed. The rocks consist almost entirely of blue or gray argillaceous sandstones, well bedded and inclined at low angles toward the Caribbean. Excavation for the locks will be in these rocks throughout.

It was shown in Part I of this report that the Chagres, as a result of a sudden uplift of the land, cut a deep and narrow gorge in its broad valley, and following the subsidence of the land this gorge was filled with alluvial materials. It is on this alluvium that a greater part of the dam will rest.

Geology of the lock site.—The site selected for the locks at Gatun is northeast of the old village about one-quarter of a mile from the river in the southern extension of the Quebrancha Hills. The temporary spillway will be cut through the low hill that rises from the floor of the valley between the French canal and the west diversion. The rocks which for convenience may be referred to as the Gatun formation, are largely argillaceous sandstones. The sand of which they are composed was derived from the older igneous rocks of the region, which, at the time the Gatun beds were being deposited, were undergoing rapid disintegration and erosion. The débris resulting from the breaking down of these rocks was transported by stream to the sea and deposited layer upon layer, until 200 feet or more had accumulated. Con-

Excavation for the locks will be almost entirely in the fine-grained argillaceous sandstone except at the lowest point to be reached at the extreme southern end where conglomerate occurs beneath the sandstones. The rocks as a whole are well consolidated and make excellent cores with the diamond drill. When taken out and exposed on the surface they remain firm and hard; in rare instances they have been found to crumble and break down into a sandy clay. The rocks are well compacted and capable of supporting heavy loads when confined, but being poorly cemented are unable to withstand erosion, and should be fully protected where such action is anticipated.

On account of the very considerable amount of clay present in all of the rocks, it is believed that they will prove to be almost entirely impervious to water. An exception will be found in the conglomerate referred to. Although this rock contains considerable clay it has been found where exposed at about sea level in test pit No. 1 to be water bearing. On April 1, 1907, a pump discharging about 12 gallons per minute was just able to hold the water at an approximately constant level in the pit. The surface of the conglomerate exposed in the sides and bottom of the pit was about 240 square feet. Wherever this conglomerate is encountered it may be expected to be water bearing at all times. In the test pit this rock stands in vertical walls without timbering, and as long as confined will support heavy loads.

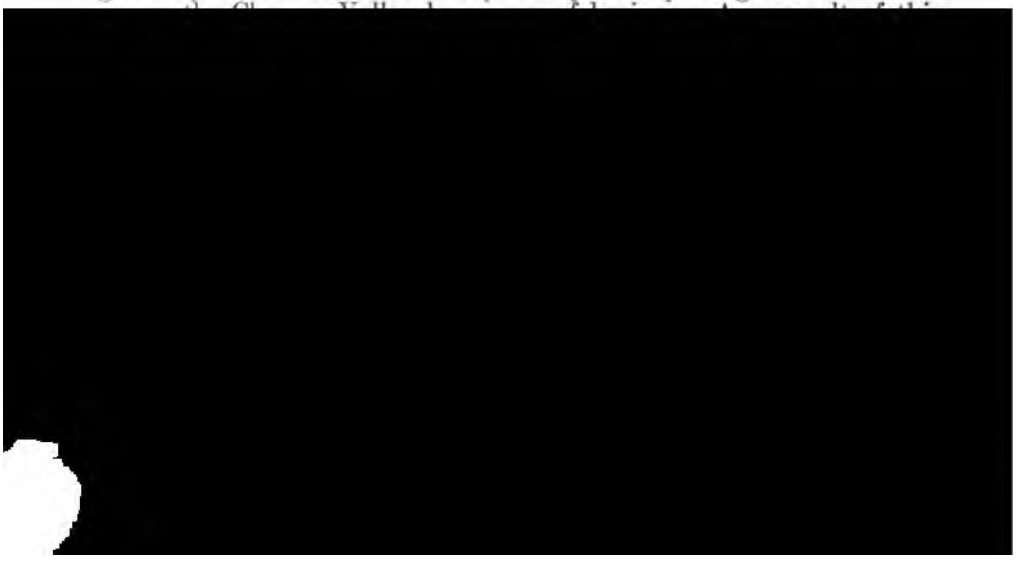
Compression tests.—In order to obtain some idea of the compression that might take place under loads equal to or greater than those due to the weight of the lock walls, a freshly exposed surface of the argillaceous sandstone near test pit No. 1 was leveled and smoothed by means of a file. Upon a square foot of this surface 100 steel rails, representing a weight of 77,350 pounds, were balanced upon the side of a short I-beam, to the under side of which a casting, having a smooth surface one square foot in area, was firmly bolted. After a load of 37,128 pounds had been applied, a settling of 0.011 of a foot was recorded, measurement being made by means of a Y-level with reference to a previously determined bench. From this point on, until forty-eight hours after the full load had been applied, no further compression was noted. It is probable that the settling at 37,128 pounds was due to the pressing out of small inequalities on the prepared surface and that no measurable compression of the rock mass took place. The load applied to the square foot was equal to 537 pounds to the square inch, more than double the greatest pressure likely to be brought to bear upon the sandstones by the lock walls.

Further tests were made upon small pieces of rock taken from different test pits. None of these pieces was larger than one-eighth of a cubic foot. They were embedded in sand and the pressure applied to smooth surfaces one-half square inch in area. Seven tests were made upon pieces of conglomerate taken from the bottom of test pit No. 1. Some of this material had been exposed on the dump for twenty days. The samples failed at pressures of from 250 to 1,625 pounds per square inch; the mean of all the tests was 867 pounds to the square inch. Nine tests were made of the argillaceous sandstone taken from different test pits at the lock site and the site for the temporary spillway. Some of this material was taken from the walls of the test pits, other pieces had been lying on the dumps for a number of days. The samples failed at from 830 to 2,800 pounds per square inch. *Two samples, both of which had been exposed on the dump for several days, showed no signs of failing when under pressures c*

6,000 pounds to the square inch. Considering these as having failed at 6,000 pounds, the mean crushing load for the nine tests was 2,572 pounds per square inch.

Geology of the dam site.—In order to understand the conditions that exist beneath the surface of the ground upon which the earth dam is to be built, it is necessary to review briefly the late geological history of the region.

At some time after the Gatun beds had been deposited, the central and southern portions of the present Isthmus were subjected to volcanic disturbances and the whole region underwent considerable deformation, concomitant elevation, and probably minor faulting. The geology of the central portion of the Isthmus indicates that a vast amount of erosion took place following the elevation of the land and that the sedimentary and later volcanic rocks now exposed represent but a very small part of the beds that covered the region at the close of the Oligocene. It was during the first period of erosion that the surface now preserved in the level tops of the Monkey Hills near Colon was developed, and which at that time represented a low, nearly level plain, or "peneplain," as it is often called, that bordered the Caribbean. A second uplift followed the period in which the Monkey Hill peneplain was developed, and seems to have been a general one throughout the whole isthmian region. The erosion that followed this second uplift thoroughly dissected the old nearly level topography and developed a second, though less perfect, terrace, best shown near Colon. This is essentially the level of the swamps. This terrace, whose surface is broken in places by remnants of the Monkey Hill level, and which may be called the Colon level, extends considerably beyond the present coast line, as shown by soundings in Limon Bay. When the erosion resulting from this second uplift had progressed long enough to have developed wide, open valleys, in which the streams meandered, a third uplift occurred. The earlier, as shown by the difference in level between the tops of the Monkey Hills and the surface of the swamps, was a little over 50 feet. The third uplift was more sudden and elevated, the land more than 300 feet. Evidence of this third epeirogenic uplift has been found repeatedly in exploring sites for dams



reefs as may have accumulated in recent times; in the same way the swamp level near Colon is to be regarded as at a slightly greater elevation than the Colon terrace, being buried beneath recent marine deposits. From the evidence of marine shells contained in the clays and sands that fill the old gorge of the Chagres it is known that the events described took place in Pleistocene time.

There is to-day at the surface no indication of the existence of the Pleistocene valley, and all knowledge concerning it has been obtained from lines of borings made across the valley at Gatun, Bohio, Buena Vista, and San Pablo.

Character of the material filling the Pleistocene valley.—During periods of maximum uplift when streams are flowing in canyons like those of the Chagres, the rivers are heavily charged with detritus. All of the finer part of this material is swept down to the sea, the coarsest is deposited along the upper portions of the streams, but gravels and small bowlders may fill the stream beds to the mouths of the rivers. If subsidence takes place before the period of canyon cutting has ceased, as in the case of the Chagres again, the velocity of streams is checked and they are capable of carrying fine material only, which is deposited far back from the mouths. In other words, one should expect to find at the bottom of such a gorge as the Chagres at Gatun a comparatively thin deposit of coarse gravel, sand, and a few bowlders, while the greater part of the alluvium should be of the finest clay and silt with a certain amount of fine gravel and sand mixed with it. Such, in fact, is the character of the alluvium filling the gorge of the Chagres as shown by numerous borings made at Gatun. The boring records indicate considerable sand and gravel at points comparatively near the present surface; it is unlikely, however, that any sand or gravel, unmixed with clay, occurs in the deposits except at or very near the bottom. The reason for the boring records specifying "sand and gravel" as they do, is that when samples are taken from time to time during the process of sinking the hole, only the coarsest material is collected, the finer clay being held in suspension and carried off with the water flowing from the hole. In certain of the holes temporary flows of water were encountered, but after a few hours the flow invariably ceased. Such flows are believed to occur, when in the course of making a boring the casing is introduced into a lenticular deposit of sand or water-bearing gravel under pressure from the overlying beds. The sands being surrounded by much less pervious material are in the nature of reservoirs in which water is stored under pressure, and when this pressure is released at the point where the casing enters the sands, water may rise to the surface, if under sufficient pressure, and flow from the top of the casing until the pressures are readjusted. Far from indicating porous materials underlying the site for the dam, the occurrence of such flows of water only proves the extremely impervious character of the materials lying between the surface and the water-bearing beds.

As a foundation for an earth dam, the geological facts show that the alluvium filling the Pleistocene valley of the Chagres at Gatun will be entirely satisfactory.

The rock in which excavation must be made for the locks is firm and hard, and only slightly permeable to water; it will stand in vertical walls without timbering and will support loads many times greater than those to which it will be subjected.

TRINIDAD SPILLWAYS.

Spillway sites 1 and 2 in the Trinidad drainage are at low divides between the Trinidad and streams flowing into the Caribbean. The rocks at these two points are essentially the same as those occurring at Gatun. They are found in a fresh condition a short distance below the surface and have about the same hardness as the Gatun rock.

At spillway No. 3 the borings failed to discover fresh rock at the depth required for foundation, the material being a clay of decomposition derived from rocks probably the same as those at the other two spillways.

LOCK SITE AT PEDRO MIGUEL.

The rocks of the lock site at Pedro Miguel are similar to those of the Gatun formation; they are geologically younger, however, and belong to the same series of beds as the sedimentary rocks of the Culebra cut. Although the Culebra beds are variable in texture, those in which excavations for the Pedro Miguel locks will be made are remarkably uniform. They consist of well bedded sandy shales containing plant remains in a few places, and at some horizons lenticular masses of concretionary limestone are common. The physical properties of the rocks differ but little from those of the rocks at Gatun. Being more argillaceous the shales are naturally less permeable to water, and experience in sinking test pits showed that they were very tough and required more blasting than did the Gatun rocks under similar conditions. This greater toughness is to be attributed to the argillaceous nature of the rock; for the same reason their compressive strength is probably slightly less than that of the argillaceous sandstone of Gatun.

In the vicinity of Pedro Miguel the Culebra beds have a prevailing dip of 5° to 10° to the southeast, varied by sharp local folding; moderate fracturing has accompanied the folding, and slickensides are shown at many points where exposures have been made by recent excavation.

Dike.—At the point where it is proposed to construct the lower gates a dike of augite-andesite or "trap" crosses the lock site in a

character of the Culebra beds northwestward is such that no flow of water is likely to occur through them even when the canal in the summit region is filled with water. Although the general dip of the beds is to the south, borings have shown the rocks to be the clay shales in large part, and as such not water bearing. Furthermore, several intrusive bodies of andesite or basalt cross the canal line between Culebra summit and Pedro Miguel, which will effectually check any flow of underground waters.

The difference in hardness between the trap rock of the dike and the much softer shales of the Culebra beds must be taken into account in planning the lock walls. The possibility of even very slight differential movement in the zone of fracturing and dislocation in the dike and shales adjacent to it should also be considered. By constructing the lock walls in sections, damage which might be done to monolithic walls as a result of such movements or from the unequal settling of foundations of different hardness will doubtless be obviated.

SOSA LOCK SITE.

The foundations for the Sosa locks will be in the same augite-andesite of which the mass of Sosa Hill is composed, and excavation will be in this rock throughout. This andesite or "trap," although traversed by a complicated system of joint planes is, whenever it has been observed, extremely massive. It has not been shattered, as has the dike at Pedro Miguel, and therefore little or no seepage is to be anticipated. As shown by the borings the elevation of the surface of hard rock is variable. A layer of decomposed rock overlies the fresh rock, and in the region of the mud flats this is covered by alluvial clays and sands. In all cases fresh rock will be found for the lock walls to rest upon.

DAMS.

La Boca Dam.—The ground upon which the La Boca Dam is to be built consists entirely of alluvium resting upon sandy shales of the Culebra formation in the middle of the valley. On both sides the alluvium rests on massive igneous rocks. The borings have developed an old channel below the present flood plain of the Rio Grande similar in character to that of the Chagres at Gatun, but they have shown that, at the point where the dam is to cross, the maximum depth is only about 70 feet below mean tide. The alluvial material consists largely of clay with sand and fine gravel mixed with it at different elevations. The material will be impervious.

Sosa-Corozal Dam.—Material of essentially the same character as that at La Boca underlies the site of the Sosa-Corozal Dam, but is of less thickness. The rocks that underlie the alluvium at depths of from 30 to 60 feet below mean tide are the sandy shales of the Culebra formation. Rhyolite tuffs are exposed in the hills at the northern end of the dam site.

Mechanical analyses of samples of alluvial materials collected at the sites of both the Sosa-Corozal and La Boca dams and from the sand bars in the bay beyond La Boca are given below. They were made at the request of the consulting engineers, Messrs. Noble, Stearns, and Freeman, in order to determine the permeability of these materials and their availability for use in constructing the dams.

Mechanical analyses of sand and mud from La Boca, Canal Zone.

[Made at the laboratory of the Bureau of Soils.]

	Number of sample.					
	2.	3.	4.	5.	6.	7.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Organic matter	0.8	1.8	0.8	7.5	5.8	2.1
Fine gravel, 2 to 1 mm	7.1	1.1	7.8	3.1	2.8	18.9
Coarse sand 1 to 0.5 mm	14.9	.8	39.9	.7	3.3	21.2
Medium sand, 0.5 to 0.25 mm	13.3	.6	26.8	.9	2.5	19.7
Fine sand, 0.25 to 0.1 mm	42.2	2.7	11.0	6.2	23.6	15.7
Very fine sand, 0.1 to 0.05 mm	.8	2.6	.4	3.4	7.1	2.2
Silt, 0.05 to 0.005 mm	1.4	43.1	4.7	31.4	25.9	9.6
Clay, 0.005 to 0 mm	3.0	49.2	9.3	54.4	34.6	12.6

No. 2. Coarse sand, 18 inches below surface, sand bar, La Boca.
No. 3. Alluvial clay from dredge, one-fourth mile south of dock, La Boca.
No. 4. Sand from river bank, near north end of Sosa-Corozal dam site.
No. 5. Mud from surface of mud flat opposite ship's ways, La Boca (near oil station).
No. 6. Mud from dredge, one-half mile south of dock, La Boca.
No. 7. Dry sample, hole No. 14, La Boca Dam; elevation −18.5, 20 feet below surface.

La Boca spillway.—The site selected for the permanent spillway at La Boca is situated about 1½ miles west of the Rio Grande. The rocks at this point are firm, hard rhyolite breccias. Fresh rock occurs at or very near the surface.

MATERIALS AVAILABLE FOR PURPOSES OF CONSTRUCTION.

Since concrete will be used almost exclusively in all construction on the Isthmus, especially in the locks and regulating works, particular attention was paid in the field to the occurrence and quality of rocks suitable for crushing, sand, and raw cement materials.

Rock for concrete.—Although the majority of the rocks on the Isthmus are much decomposed near the surface, fresh material occurs at a number of places suitable for concrete or other purposes where crushed stone is required.

Practically all the rocks available for this purpose are the basic andesites or basalts, commonly referred to as "trap," that occur in the central and southern portions of the Isthmus. There are extensive outcrops at Sosa and Paraiso near the sites for the locks at the Pacific end of the canal. The rock at the proposed permanent spill

unreliable for use as dimension stone at points where exposed to wear or subjected to considerable pressure.

As soft rock alone occurs at the Trinidad spillway sites, crushed stone from Porto Bello will have to be used at whichever site is selected.

Sand.—No sand suitable for use in mortar or concrete has been found near the points where such material will be required. Sand of a fair quality occurs at a number of places in the Chagres River between Gamboa and Bohio. This sand could be used, if necessary, but the bars are completely covered during the rainy season, and the amount of sand at any one place is uncertain on account of variations in texture. Possibly 8 per cent of earthy or clayey matter is present in this sand, but not in sufficient quantities to be harmful.

A very high grade of sand containing over 80 per cent sharp, glassy quartz occurs on the beach at Chorrera, 18 miles west of La Boca. The sand is only of moderate coarseness, the diameter of the grains ranging from 0.25 to 0.75 mm. It is believed to be present in ample quantity. On the Atlantic side large deposits of sand derived from basic igneous rocks and containing but little quartz have been found just east of the harbor of Porto Bello. Although not of as high grade as the Chorrera sand, this material will be, it is believed, entirely satisfactory for use with the concrete at Gatun.

CEMENT MATERIALS.

In July and August, 1906, at the time of my first visit to the Isthmus, I was directed by the chief engineer to make a careful search for raw materials suitable for use in the manufacture of a high grade of Portland cement. Some months before samples of a supposed cement rock had been sent to the laboratory of the Geological Suvey by the Commission for analysis, but the material proved to be of no value.

The limestones that occur sparingly in the Zone in the vicinity of Empire are variable in composition and limited in extent, while those exposed in the canyon of the Chagres River above Alhajuela, even if sufficiently pure, are too remote to be used economically.

Clay is one of the commonest substances in the whole Isthmian region, but its physical condition is extremely variable, notwithstanding the fact that its chemical composition is very uniform. Certain of the shales occurring in the various sedimentary formations in the vicinity of Culebra, and also on the Atlantic coast, might be used, but the difficulty of obtaining them in large quantities and of uniform quality and at points near the coral rock are serious objections.

After some study of the different kinds of argillaceous and calcareous rocks or deposits on the Isthmus, considering both their chemical and physical composition and accessibility, three classes of materials were decided upon as probably suitable for use. For the calcareous element, coral from the reefs bordering the whole Caribbean coast and occurring in great abundance in the immediate vicinity of Colon was decided upon.

The recent clays and silts brought down by the Chagres River and deposited near its mouth or in the French canal emptying into Limon Bay are extremely uniform both in texture and in chemical

composition. It was feared, however, at the time samples were collected, that the percentage of silica contained in the clays might be too low, so that samples were also taken of the pumiceous rhyolite tuffs occurring at the western end of the Panama Railroad bridge near San Pablo.

A sample of the coral rock from Limon Bay, three samples of mud taken from different points in the French canal between the dry dock at Mount Hope and the mouth of the Rio Mindi, and also a sample of the rhyolite tuffs from San Pablo were analyzed in the chemical laboratory of the United States Geological Survey. The results of these analyses are given below:

Partial analyses of cement materials.

[Made at the laboratory of the U. S. Geological Survey.]

	I.	II.	III.	IV.	V.	VI.
SiO_2	39.41	49.31	49.49	46.00	58.00	1.20
$Al_2O_3+(TiO_2, P_2O_5)$	20.31	16.05	18.11	28.84	14.50	.10
Fe_2O_3 (total iron)	9.49	10.55	9.45		5.88	.47
CaO				1.94		
MgO				2.49		
Na_2O				1.84		
K_2O				.63		
H_2O-				6.46		
H_2O+				9.02		
Cl				.95		
S				.29		
$CaCO_3$						93.73
$MgCO_3$						.57

I. Twenty feet from the east bank of French canal, opposite middle of dry-dock slip, in 20 feet of water.
II. Middle of French canal, halfway between dry dock and mouth of Mindi, opposite triangulation tower.
III. Middle of canal at water surface, mouth of Mindi.
IV. Mixtures of equal weights of I, II, and III.
V. Rhyolite tuff, west end of Panama Railroad bridge across Chagres, San Pablo.
VI. Coral from Limon Bay, Colon, Panama.
I, II, III, IV, and VI, F. W. Schaller, analyst.
V, E. C. Sullivan, analyst.

It will be seen from these analyses that the coral is a remarkable pure lime carbonate. The muds, although thought to be rather low

BURNING TESTS OF CEMENT MATERIALS FROM PANAMA.

[Made at the Lehigh Valley testing laboratory.]

Chemical analyses.

FIRST BURNING.

	Raw material.		Calculated.		As analyzed.	
	Coral, 2.8.	Clay, 1.	Mix.	Clinker.	Mix.	Clinker.
SiO_2	0.89	49.91	13.79	21.56	13.93	21.08
Fe_2O_3	.36	10.06	2.91	4.58	2.89	4.64
Al_2O_3	.32	15.48	4.31	6.79	4.25	6.73
CaO	52.62	6.98	40.61	63.95	41.22	63.60
MgO	.38	2.27	.87	1.37	.89	1.09
SO_3					.63	1.06
Loss on ignition	43.50	12.92				

SECOND BURNING.

	Raw material.		Calculated.		As analyzed.	
	Coral, 3.33.	Tuff, 1.	Mix.	Clinker.	Mix.	Clinker.
SiO_2	0.89	60.93	14.75	22.63	14.39	22.83
Fe_2O_3	.36	5.46	1.54	2.39	1.80	2.87
Al_2O_3	.32	15.86	3.91	6.08	3.93	6.32
CaO	52.62	4.02	41.43	64.43	42.12	64.32
MgO	.38	1.79	.71	1.10	.84	1.58
SO_3					.41	.34
Loss on ignition	43.50	10.44				

THIRD BURNING.

	Raw material.			Calculated.		As analyzed.	
	Coral, 30.	Clay, 5.	Tuff, 5.	Mix.	Clinker.	Mix.	Clinker.
SiO_2	0.89	49.91	60.93	14.19	22.42	14.53	22.75
Fe_2O_3	.36	10.06	5.46	2.16	3.41	2.30	3.67
Al_2O_3	.32	15.48	15.86	4.06	6.41	4.09	6.42
CaO	52.62	6.98	4.02	41.13	64.97	41.21	64.57
MgO	.38	2.27	1.79	.78	1.23	.85	1.58

Specific gravity.

Coral-clay cement	3.23
Coral-tuff cement	3.20
Coral-clay-tuff cement	3.17

Fineness.

	Sieve—		
	No. 50.	No. 100.	No. 200.
	Per cent.	*Per cent.*	*Per cent.*
Coral-clay cement	100	98	90.3
Coral-tuff cement	100	99	93.3
Coral-clay-tuff cement	100	95	88.6

SOUNDNESS.

All the pats for each cement were reported sound and hard on the completion of the tests, but after a month or six weeks some became detached from the glass. The pats were made from freshly burned clinker, ground as soon as cold, and without the addition of plaster. *A very good showing* for a laboratory test.

Setting time.

[2 per cent plaster added.]

	Initial set.	Final set.
	h. m.	h. m.
Coral-clay cement	1 45	5 25
Coral-tuff cement	1 27	6 47
Coral-clay-tuff cement	2 00	5 30

Tensile strength of briquettes.

[Pounds per square inch.]

CORAL AND CLAY.

	Neat.				Standard sand, 3 to 1.		
	24 hours.	7 days.	28 days.	3 months.	7 days.	28 days.	3 months.
1	a 200	630	726	756	190	298	367
2	250	600	732	749	220	321	340
3	261	670	698	700	206	285	390
Mean	237	633	719	735	205	301	365

a Broken at 21 hours.

Gauge water—neat, 23 per cent; sand, 11 per cent; 2 per cent plaster of Paris added.

CORAL AND TUFF.

	Neat.				Standard sand, 3 to 1.		
	24 hours.	7 days.	28 days.	3 months.	7 days.	28 days.	3 months.
1	211	542	630	636	233	298	392
2	203	586	661	604	234	315	390
3	215	555	613	630	215	323	395
Mean	210	561	635	623	227	312	392

Gauge water—neat, 25 per cent; sand, 11½ per cent.

CORAL, CLAY, AND TUFF.

In general the strength of the cement can be regulated at will by varying the composition of the raw mix and the degree of hardness in burning. Burned in a rotary kiln on a commercial scale, cement of the composition of the trial burnings would undoubtedly develop a strength of 800 pounds at seven days. The alumina is not so high as to preclude the possibility of burning a lower limed mixture if desired.

Without the addition of plaster the setting time of the rhyolite-coral cement is too quick, but this is also a matter that can be readily corrected in arranging the mix and burning.

Considering the reports as a whole, it may be said that the materials tested are suitable for the manufacture of the highest grade of Portland cement and; according to the manager of the testing laboratory, make a better showing than the average standard brands from the Lehigh district tested at the same laboratory.

PHYSICAL CHARACTER OF THE RAW MATERIALS.

Coral.—The coral rock is of very moderate hardness and may be easily obtained either by dredging or surface excavation of reefs bordering the coast. It may be crushed with little difficulty and would require no drying.

Clay.—The clay or mud from the Chagres or the French canal may be easily and cheaply dredged. Its uniformity of composition is undoubted, and the only serious expense connected with the use of this material would be in the drying. It is possible that a wet process might be found, in this case, more economical than the generally used dry process.

Tuff.—The rhyolite tuff is soft and easily quarried and crushed. Its location near the Panama Railroad is an advantage in the matter of shipment, but the distance (about 20 miles) from the point where the coral could be profitably delivered would be the most serious objection to the use of this material.

AMOUNT OF RAW MATERIAL AVAILABLE.

Taking 5,000,000 barrels as the total amount required, this would call for about 1,500,000 tons of raw materials, of which 1,125,000 tons would be of the coral and the remaining 375,000 tons of the clay or its equivalent—that is, coral rock would have to be excavated to a depth of 1 yard over an area a little less than one-half of a square mile, considering 1 cubic yard of coral in place as weighing 1 ton, which is a generous estimate. A very large part of the required amount of coral could be obtained from the beach at Colon by surface excavation.

In round numbers, the 375,000 tons of clay would represent the excavation of as many cubic yards by dredging to a depth of 6 feet over an area 100 feet wide and 3½ miles long. Mud from the canal, Chagres, or diversions at any point below Gatun, would be available for this purpose, and in amounts far in excess of those required for 5,000,000 barrels of cement.

The weight of the rhyolite tuff is something over 1 ton to the cubic yard, but considering, for simplicity in calculation, that this is the equivalent weight, 375,000 cubic yards would be required. Half as much again of this material is in sight at the west end of the railroad bridge crossing the Chagres at San Pablo, and probably four or five *times this amount* is available as a conservative estimate.

Speaking generally, it may be said that the amount of coral is far beyond that required for twice the number of barrels of cement estimated upon, while the same is equally true of the clay and rhyolite tuff.

KINDS OF MATERIAL TO BE USED.

With so little difference in the chemical composition and physical properties of the three kinds of cement made from the clay, or rhyolite tuff, or combination of both, with the coral as a base, the deciding factor in determining the kind of material to be used is the cost of the raw materials. In this there would appear to be a decided advantage in favor of the mud or clay from the Chagres or canal. This may be obtained entirely by dredging and transported by water directly to the mill, which would be most favorably located at some point midway between Gatun and Colon. As has been said, the principal objection to the use of the clay would be the necessity of drying before burning. By the accumulation of large stock reserves, most of this drying could take place in air, if protected from rain, and the cost would be considerably reduced.

Although the rhyolite tuff would not have to be dried before grinding, the cost of transportation from San Pablo to the mill would be excessive.

FUEL.

Three kinds of fuel may be used in operating the mill and in the kilns—coal from the United States, oil, or local lignites. The relative cost of oil and coal is about the same at the prices now prevailing on the Isthmus—that is, $4.50 a ton for coal and 80 cents a barrel for oil. It is believed, however, that the fuel value of the oil would be greater and its efficiency could be increased above that of the coal. As mentioned later, the reported deposits of lignite occurring in the vicinity of Tabernilla might be considered in the manufacture of cement. Fuel of this type is of low grade and used directly would be of little value, but the high percentage of volatile matter present in the lignite could be taken advantage of by means of the gas producer and used both in the kilns and for power.

One of the largest costs for labor in a commercial plant in this country is for packing the cement, and this could be eliminated on the Isthmus.

All these costs are, in my opinion, maximum ones and might be considerably reduced in practice.

If oil were used in place of coal, taking into account the added efficiency, the price for fuel could undoubtedly be reduced to 50 cents a barrel. A serious objection to the use of oil, however, would be the dependence upon one kind of fuel, possibly from one source, and the consequent difficulty of controlling prices and insuring a constant supply.

The use of gas derived from lignite would probably reduce the cost still further if an abundance of this material of good quality could be obtained on the Isthmus. It is unlikely that a sufficient quantity of this fuel exists at points convenient for mining to justify the installation of a gas-producing plant, so that should the manufacture of cement be undertaken coal from the United States would probably be the best fuel to use.

EFFECT OF CLIMATE.

The extreme humidity existing at all times of the year, and especially in the rainy season, would probably have no harmful effect on the finished cement. If anything, the humidity would be an advantage in hastening the process of aging, which, as it is now understood, consists merely in the slaking of the free lime that is present in the cement immediately after burning.

CONCLUSION.

In conclusion it may be said with confidence that Portland cement equal to the best grades manufactured in the United States or Europe may be made on the Isthmus and at a cost not greater than $1.34 a barrel, and probably less.

LIGNITE.

Thin seams of lignite are not uncommon in the clays and shales of the Culebra beds exposed in the cut between Empire and Gold Hill. Traces of lignite have also been found at a number of other places on the Isthmus. Coal mines were referred to in the Lull report of 1879 as occurring in the Rio Indio drainage west of the present Canal Zone, the deposits being reached from Puerto Condido on the Atlantic side or from Chorrera on the Pacific. Even if this coal exists as reported, the cost of mining and transportation would be so high as to prohibit its use.

At the request of the chief engineer I examined properties in the vicinity of Tabernilla said to contain large deposits of coal. At the time of the examination, in August, 1906, the test pits that had been sunk in prospecting for the coal were completely filled with water or earth, so that there was no means of discovering the character of the reported deposit. The small amount of material remaining at the sides of the pits indicated that the so-called coal was in reality a low to medium grade lignite.

A report made by a French engineer stated that the material was of excellent quality and occurred in a seam 3 meters, or about 10 feet, thick, which underlies a thinner seam of coal of inferior grade. *Approximately* 1,000,000 tons were reported as available.

In my opinion it is extremely improbable that any deposit of such magnitude exists at this locality. It is unlikely, also, that the lignite if mined would prove to be satisfactory as a fuel, and combining costs and efficiency there would be little or no advantage in using these lignites instead of good coal from the United States.

There is a possibility that fuel of this character might be valuable for gas-producing purposes in the manufacture of cement as already pointed out.

In my report to the chief engineer of August, 1906, I stated that in my opinion it was desirable to have some prospecting done by means of drills in the vicinity of these reported deposits, in order to obtain some reliable information as to their extent and quality. As a part at least of the so-called coal lands will be submerged by the Gatun Lake it would be well to have some data upon which to base the value of such lands in case of condemnation.

The test pits referred to are located on the banks of a small stream, the Rio Negro, entering the Rio Frijoles from the northeast. The locality is reached by a road or trail, and is about 1¼ miles northeast of Tabernilla, near a large ranch.

In making the borings all the core should be saved, and samples of the coal or lignite should be sent to the Geological Survey for analysis, together with the complete boring records.

Should coal be found as reported in the vicinity of the old test pits, further prospecting should be carried on by drilling in order to discover the extent of the deposit—that is, lines should be run at right angles to one another from the first test hole as a center, and borings made on these lines at intervals of from 100 to 200 feet for distances of at least 1,000 feet in each direction from the center.

GENERAL SUMMARY.

Excavation in Culebra Cut.—No difficulties are to be anticipated in continuing the excavation in the Culebra region except at Contractors Hill, where it is possible, but not probable, that landslides may take place when lower levels are reached. Should this danger present itself, it may be overcome by a reduction in the angle of slope.

Sites for dams and locks.—The rocks at all points where locks are

APPENDIX F.

ANNUAL REPORT DEPARTMENT OF LABOR, QUARTERS, AND SUBSISTENCE, JULY 1, 1906–JUNE 30, 1907.

Average monthly force, July to June.

Month.	Construction and engineering.	Labor, quarters, and subsistence.	Law and government.	Sanitation.	Disbursing.	Auditing.	Total.
July	13,636	.....	.....	2,786	.....	.....	16,422
August	14,058	.....	.....	3,012	.....	.....	17,070
September	14,117	.....	.....	2,931	.....	.....	17,048
October	14,078	.....	.....	3,028	.....	.....	17,106
November	13,716	924	412	2,659	93	68	17,872
December	15,149	1,040	312	2,838	88	58	19,485
January	16,254	1,148	357	3,106	98	57	21,020
February	18,520	1,341	375	2,645	99	57	23,037
March	19,564	1,440	339	2,618	96	62	24,119
April	20,000	1,341	602	2,156	97	72	24,267
May	20,102	1,403	622	2,280	101	62	24,570
June	18,810	1,728	426	2,188	112	63	23,327

NOTE.—Prior to November, 1906, reports were consolidated under the heads of "Construction and engineering" and "Sanitation."

The force report has shown a steady increase. The decrease in June was made up by a large increase in the Panama Railroad force, the laborers being furnished from the Isthmian Canal Commission force.

Classified force, June 30, 1907.

From United States	4,404
Europeans	4,317
West Indians	14,606
Total	23,327

Panama Railroad force.

From United States	1,140
West Indians	4,979
Total	6,119

Statement of changes made each month in the gold personnel of the force on the Isthmus.

Month.	Employed in United States.	Employed on Isthmus.	Total employed.	Separations.	Net additions.
July	155	187	342	274	68
August	183	169	352	359	a 7
September	294	204	498	266	232
October	324	187	511	318	193
November	438	181	619	464	155
December	126	223	349	331	18
January	182	277	459	478	a 19
February	307	238	539	251	288
March	272	254	526	333	193
April	284	336	620	419	201
May	227	250	477	432	45
June	252	260	512	442	70
Total	3,038	2,766	5,804	4,367	1,437

a Loss.

NOTE.—Amount expended for transportation of skilled labor to the Isthmus, $136,710.

Laborers brought to the Isthmus at the expense of the Commission.

From—	July to December.						
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Curacao, D. W. I.			23				23
Bordeaux					178	126	304
Santander					160	163	323
St. Nazaire					297	382	679
Vigo				239	260	309	808
Martinique					4	561	565
Barbados	858	290	163	110	763	195	2,379
Trinidad					638	441	1,079
Total	858	290	186	340	1,732	2,745	6,151

From—	January to June.						
	Jan.	Feb.	Mar.	Apr.	May.	June.	Total.
Panama (Chiriqui)				13			13
Bordeaux	151	136	58	559	142	62	1,108
Santander	359	297	306	200	378	171	1,711
St. Nazaire	192	154	338		271	118	1,073
Vigo	207	163	119	137	184	48	858
Barcelona						35	35
Martinique	379		876				1,255
Barbados	2,446	1,294					3,740
Guadeloupe			713	461	728		1,902
Total	3,734	2,044	2,410	1,370	1,703	434	11,695

Grand total, 17,846. Europeans, 6,899.

The men brought from Vigo, Santander, and Barcelona were Spaniards; those from St. Nazaire and Bordeaux, Italians, Greeks, and French. The Royal Mail Steam Packet Company brought Europeans from Vigo, all negroes from Barbados and Trinidad, and the majority of those from Martinique and Guadeloupe. The Compagnie Generale Trasatlantique brought Europeans from Bordeaux, Santander, and St. Nazaire, and the balance of the negroes from Martinique and Guadeloupe.

Amount expended for transportation of laborers to Isthmus.

From—	July to December.					
	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Curaçao, D. W. I.		$172.50				
Martinique					$44.00	$4,956.40
Europe				$8,141.54	45,675.40	36,756.46
Barbados	$9,021.60	2,436.00	$1,369.20	1,130.92	1,404.00	5,493.60
Trinidad					4,593.60	2,175.20

The following statement shows the immigration and emigration, by months, during the fiscal year, at the port of Colon, through which port practically the entire flow of labor for the canal comes and goes:

Months.	Immigration.	Emigration.	Months.	Immigration.	Emigration.
July	2,516	1,250	February	2,574	1,392
August	1,860	1,358	March	2,454	1,814
September	1,787	1,366	April	2,295	2,128
October	2,454	1,816	May	2,348	2,558
November	2,262	1,779	June	2,771	1,987
December	1,750	2,135			
January	2,953	1,307	Total	28,024	20,890

Making a total of 7,134 in favor of immigration during the entire fiscal year. This includes both cabin and steerage, with the latter largely in preponderance. The figures given do not include the contract laborers brought to the Isthmus at the expense of the Commission.

During the fiscal year the Department has recommended the construction of the following buildings:

Dormitories	13	Assembly hall and church	1
Kitchens	36	Bath house	1
Laundry buildings	4	Range closet	1
Mess halls	4	Sheds for ice	2
Cooking sheds	65	Stable	1
Bunk houses	20	Type 5	37
Colored married quarters	10	Type 7	10
Gallego messes	10	Type 8	7
Office buildings	2	Type 8–A	1
Hotel-help's quarters	1	Type 10	2
Dispensary buildings	2	Type 14	76
Storerooms	4	Type 15	41
Commissary-help's quarters	1	Type 16	7
Commissaries	6	Type 17	46
Hotels	3	Type 18	15
Boiler sheds	1	Type 19	3
Fumigators	8		

Buildings for all purposes in use June 30, 1907.

Houses for skilled married employees	537
Houses for skilled bachelor employees	223
Houses for unskilled married employees	329
Houses for unskilled bachelor employees	528
Hotels	16
Mess halls	19
Kitchens	55
Miscellaneous (offices, storehouses, clubhouses, bath houses, etc.)	501
Total	2,208

SUBSISTENCE.

Our operations for the past fiscal year show a gain of $12,971.54 on hotels and a gain of $59,385.44 on kitchens. A profit was shown each month on the operation of both hotels and kitchens, with the exception of June, in which month a loss of $3,755.32 was experienced on the hotels. This gives a total net income for the year of $72,356.98. From this should be deducted $7,487.66, loss on the Washington Hotel and Hotel Tivoli, leaving an apparent gain for the year of $64,869.32.

The profits of the subsistence department are not as large as they appear. The amount allowed for depreciation of plant is too small, and there are various other items which have not been considered. The profits, however, have been sufficient to pay for all the equipment bought, exclusive of buildings and fixtures.

On June 30, 1907, we were operating 16 hotels for furnishing meals to American white employees, 18 messes for Europeans, and 23 kitchens for natives of the West Indies. We serve approximately 1,000,000 meals per month.

Statements following show operations of hotels and kitchens by months:

HOTELS.

Month.	Expense.	Income.	Gain.
July	$23,061.03	$24,806.75	$1,745.72
August	27,514.04	27,598.10	84.06
September	27,906.01	29,102.60	1,196.59
October	31,920.56	33,363.61	1,443.05
November	37,155.40	37,565.10	409.70
December	42,994.67	44,559.82	1,565.15
January	42,690.74	44,148.88	1,458.14
February	39,056.57	42,175.45	3,118.88
March	45,560.06	49,811.39	4,251.33
April	51,211.43	52,404.58	1,193.15
May	52,843.54	53,104.63	261.09
June	57,808.81	54,053.49	.....
	475,967.54	492,694.40	16,726.86
Loss	.....	.....	3,755.32
Net gain	.....	.....	12,971.54

Washington Hotel shows a loss for the year of $820.34
Hotel Tivoli shows a loss since January 1, 1907 ..... 6,667.32

New hotels were opened at the following places during the past fiscal year: Las Cascadas, September 17, 1906; Tabernilla, August 2, 1906; Gatun (2), July 24, 1906, and May 15, 1907; and Porto Bello, May 10, 1907.

KITCHENS.

Month.	Expense.	Income.	Net gain.
July	$6,326.10	$7,671.92	$1,345.82
August	4,332.11	5,112.22	780.11
September	4,875.18	5,729.63	854.45
October	6,250.06	6,850.28	598.43

COST.

Month.	Administration.	Labor agents.	Clerks.	Foremen janitors.	Subsistence.			Total.
					Stewards' clerks.	Cooks.	Waiters' helpers.	
July	$1,350.00	$1,600.00	$6,230.02	$8,081.35	$929.82	$1,102.90	$2,668.92	$21,963.01
August	1,683.34	1,650.00	6,879.31	8,707.28	1,003.93	1,201.33	2,708.07	23,833.26
September	1,683.34	1,679.17	5,610.96	9,962.16	1,788.23	1,437.15	2,784.53	25,091.58
October	1,683.34	1,650.00	6,704.09	12,881.76	2,265.63	1,393.36	3,156.64	29,534.82
November	1,683.34	1,650.00	7,094.11	14,052.69	2,568.54	1,694.45	3,589.33	32,332.46
December	1,683.34	1,650.00	8,207.45	15,223.22	2,783.49	2,060.74	5,188.08	36,796.32
January	1,916.67	1,650.00	7,562.40	15,806.96	4,779.19	3,609.08	8,393.38	43,717.68
February	2,166.67	1,650.00	7,972.16	15,835.37	5,134.62	5,313.99	9,497.20	47,570.01
March	2,166.67	1,650.00	8,548.75	16,332.20	5,543.86	5,151.76	10,434.33	49,827.57
April	2,166.67	1,650.00	8,242.15	17,265.99	6,893.72	6,245.12	8,865.92	51,329.57
May	2,166.67	1,650.00	9,921.38	18,630.72	6,277.24	5,023.48	10,680.72	54,850.21
June	2,166.67	1,650.00	9,694.34	21,809.59	6,282.21	5,653.25	10,650.28	57,906.44
Total					46,250.48	40,386.61	78,617.50	474,752.93

Total subsistence, $165,254.59. The subsistence item of $165,254.59 is included in the expense of operation of hotels and kitchens. The net cost of operation of the department of labor, quarters, and subsistence for the period is, therefore, $309,498.34.

Respectfully submitted.

JACKSON SMITH,
Manager.

Col. GEO. W. GOETHALS,
Chairman and Chief Engineer, Culebra.

APPENDIX G.

REPORT OF THE HEAD OF THE DEPARTMENT OF CIVIL ADMINISTRATION.

ANCON, *September 10, 1907.*

SIR: I have the honor to inclose herewith annual report of the department of civil administration for the twelve months ended June 30, 1907.

Very respectfully,

JO. C. S. BLACKBURN,
Head of Department of Civil Administration.

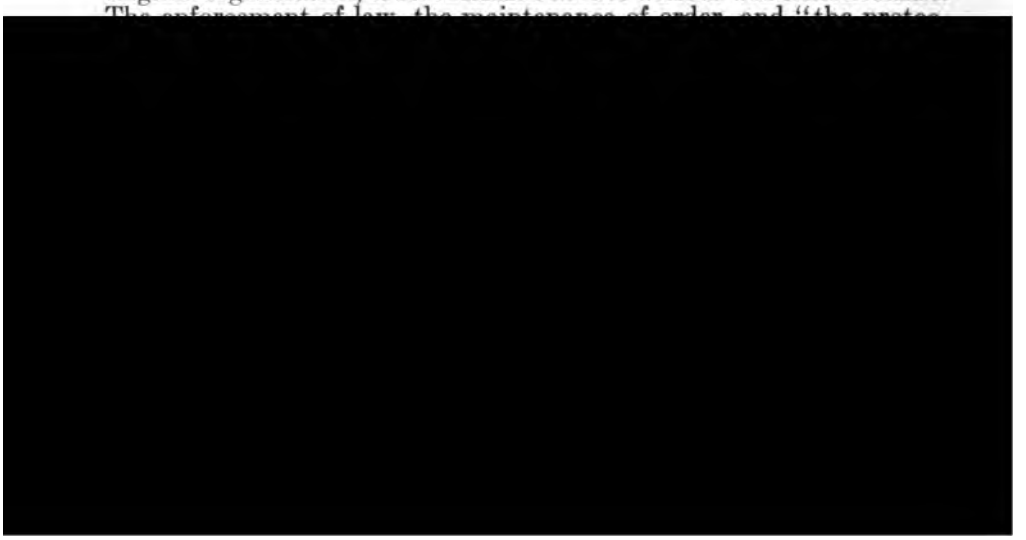
The CHAIRMAN, ISTHMIAN CANAL COMMISSION,
Culebra.

ISTHMIAN CANAL COMMISSION,
DEPARTMENT OF CIVIL ADMINISTRATION,
Ancon, August 23, 1907.

SIR: I have the honor to submit the following report of the department of civil administration of the Isthmian Canal Commission for the period from October 1, 1906, to June 30, 1907.

This department was first organized by the Canal Commission in September, 1904, as "the government of the Canal Zone." Its functions were to exercise the judicial and executive rights of government in the Canal Zone acquired by the United States under the treaty with Panama.

Although the department has undergone several changes since its original organization, it still remains in fact what it was then in name.



The last report of the governor of the Canal Zone was submitted October 1, 1906, and in it the work of the department was brought up to September 30, 1906. Governor Magoon left the Isthmus September 25, 1906, and the duties of the head of the department of government and sanitation, as the department was then known, were performed by the executive secretary from that time until November 17. The Executive order of that date divided the Commission into seven departments, with the general counsel at the head of one and provided:

> The general counsel shall have charge of (1) all legal matters pertaining to the Commission, whether in the United States or on the Isthmus of Panama; (2) the administration of civil government within the Canal Zone, and shall exercise, through a local administrator, the authority heretofore vested in the governor of the Canal Zone.

The general counsel returned to the United States November 25, leaving the executive secretary in charge of the Zone government, under an order issued by authority of the Commission.

On April 2 the Secretary of War, by direction of the President, issued an order vesting the authority of the governor or chief executive of the Canal Zone in the chairman of the Commission. The chairman exercised that authority until May 9, when the undersigned, a member of the Canal Commission, was placed in charge of the Zone government as "head of the department of civil administration," under an order issued by the chairman of the Commission.

By the order of November 17, 1906, the health department was separated and made independent.

The department as now organized includes the executive office, the courts of the Canal Zone, the office of the prosecuting attorney, the divisions of revenues, posts, customs, lands, administration of estates, police, education, fire protection, and public works. The head of the department also represents the Commission in its relations with Panama and with foreign consuls accredited to Panama whose jurisdiction extends to the Canal Zone.

LEGISLATION FOR THE ZONE.

The act of Congress approved April 28, 1904, provided that until the expiration of the Fifty-eighth Congress all the military, civil, and judicial powers, as well as the power to make all rules and regulations necessary for the government of the Canal Zone, and all the rights, powers, and authority granted by the terms of the treaty to the United States, should be vested in such person or persons and exercised in such manner as the President should direct. By a letter of May 9, 1904, addressed to the Secretary of War, the President directed that these powers should be vested in and exercised by the Canal Commission until the close of the Fifty-eighth Congress. In the exercise of them the Commission enacted various laws for the government of the Zone. The power of the Commission, however, to legislate for the Zone ceased to exist on March 4, 1906, when the Fifty-eighth Congress expired. After that date the authority to legislate for the Zone reverted to the President.

In the exercise of this authority the President, and by his direction the Secretary of War, signed during the year several important Executive orders, among them orders abolishing the five municipalities and creating in their stead administrative districts, extend-

ing the United States patent, trade-mark, and copyright laws to the Zone; regulating insurance companies; providing for the registration of land titles and the celebration of marriages; amending the penal laws, and putting in force a new code of civil procedure.

By the order of March 13, 1907, the Commission is authorized to enact, with the approval of the Secretary of War, ordinances relating to police, sanitation, and taxation, and any other matters heretofore regulated by municipal ordinances. Under this authority the Commission has enacted ordinances regulating the sale of liquor and prescribing certain taxes in the Zone.

Since the order governing insurance companies in the Canal Zone became effective no company has qualified for business.

The rates of fire insurance in the Zone, because of the inflammable character of the buildings, have been very high in the past, and it is reported that the annual fee of $50 required of each company, in addition to the tax of 1½ per cent on its premium receipts, constitutes a burden which no company has yet felt able to carry at the old rates of insurance. It is desirable to encourage both fire and life insurance in the Zone, and it is believed that if the taxes provided for by that order were reduced advantage would result to the inhabitants of the Zone. The character of the companies doing business in the Zone would be assured by the other provisions of the order.

RELATIONS WITH PANAMA.

The relations between the Commission and Panama are, and have been during the past year, very satisfactory. Many important questions have been discussed, and, with few exceptions, disposed of satisfactorily.

Building regulations in Colon.—The demand for buildings at Colon gave rise during the year to a tendency to ignore sanitary requirements in the construction and location of new buildings.

The chief sanitary officer prepared a draft of building regulations, which, after discussion and amendment, was published in April as a decree of the President of Panama. Marked improvement in the character of buildings under construction at Colon has resulted from

submitted to them, except the islands in Panama Bay and the improvements upon them.

The American members of the joint commission made to the Secretary of War a report of the proceedings and of their inability to agree with the Panama members, who made a similar report to the secretary of foreign affairs of Panama. All the proceedings, including the testimony and documentary evidence, were reported and preserved.

It appears from the reports submitted by the American and Panama members that they were hopelessly at variance, the Panama members voting for values ranging from five to a hundred times the values voted for by the American members.

It is greatly to be regretted that the commission was unable to reach a conclusion. Under the terms of the treaty, the United States is occupying most of the properties, the value of which was submitted to the joint commission, and the Canal Commission's work is, therefore, not interfered with by the delay. But the owners of the properties, some of which have been occupied ever since the Commission entered upon its work on the Isthmus, are entitled to have the values determined and payment made as early as that can be done. Justice to them requires that an early effort should be made to agree with Panama upon an umpire, as provided for by the treaty, to decide the value of the property, upon the evidence taken by the joint commission.

The Pacific Mail Steamship Company claims title to an undivided one-half interest in the islands of Naos, Culebra, and Flamenco, in Panama Bay. The value of this interest was submitted to the joint commission, and the members reached a unanimous agreement upon it. They also agreed upon the value of the buildings belonging to the Pacific Mail Steamship Company on the island of Flamenco, which were desired by the health department for use as a quarantine station. Since their report was made, however, it has been decided not to use those buildings, but to construct new buildings on the island of Culebra.

As to the claims originating from the Malambo fire, it would seem that the joint commission's authority was limited to an ascertainment of the value of the property destroyed. The general counsel of the Commission and the secretary of government and foreign relations of Panama sought to enlarge the powers of the commission so as to enable it to ascertain and determine whether the fire was caused by the negligence of employees of the Canal Commission, in carrying out the necessary work of fumigation, as is evidenced by the correspondence herein inserted:

ANCON, *April 5, 1907.*

Mr. SECRETARY: In view of your contention that under the terms of the treaty the joint commission is authorized to pass upon values only, and not to determine specific questions of fact or law, I now propose that, by a special agreement, we stipulate that the joint commission, which we are now about to assemble to pass upon, among others, the claims for damages alleged to have been caused by our sanitary department in the work of fumigation in the city of Panama, be authorized to determine, in addition to the question of value, the question: Whether the fire in the Malambo district was caused by the negligence of the employees of the Isthmian Canal Commission in carrying out the necessary work of fumigation.

I have the honor to remain, very respectfully, yours,

RICHARD REID ROGERS,
General Counsel.

His Excellency RICARDO ARIAS,
Secretary of Government and Foreign Affairs, Panama.

[Translation.]

SECRETARY OF GOVERNMENT AND FOREIGN RELATIONS,
DEPARTMENT OF FOREIGN AFFAIRS,
Panama, April 9, 1907.

SIR: In reply to your esteemed communication, dated the 5th instant, with reference to the joint commission which is about to convene, in conformity with Articles VI and XV of the canal treaty, I take pleasure in informing you that, in compliance with instructions from His Excellency the President of the Republic, the National Government accepts the proposal contained in said communication, which is that the joint commission will conscientiously decide, as an advisory board, if, in the opinion of its members, the Malambo fire was caused by the negligence of the employees of the sanitary department, while carrying out the work of fumigation.

With sentiments of high consideration, I am, your obedient servant,

RICARDO ARIAS.

Hon. RICHARD REID ROGERS,
General Counsel, Head of the Department of Government of the Canal Zone.

Evidence was taken, and the claims were considered by the joint commission, which reported that, being unable to determine the origin and cause of the fire, it was of the opinion that the claims should be compromised, and recommended the payment by the United States to the claimants of amounts aggregating $54,037. No action has been taken to give effect to the findings of the commission.

Central and South American Telegraph Company's "All American" cable.—In order to land the new "All American" cable in the Canal Zone, the Central and South American Telegraph Company made application for authority to bring it through Manzanillo Bay, on the east of Manzanillo Island. Under the provisions of the provisional agreement of delimitation signed by General Davis and representatives of the Panama Government June 15, 1904, Colon harbor is described as "that part of Limon Bay lying north of a line drawn due west from the Columbus statue on Cristobal Point." Limon Bay was understood to be the bay south of a line drawn from the lighthouse on Manzanillo Island to Point Toro.

When the question of laying the cable through Manzanillo Bay came up a description of the boundaries of Colon Harbor was submitted to the Panama Government, and the secretary of foreign affairs of that Government agreed that under the provisional agreement of delimitation Colon Harbor is bounded on the south by a

3-mile limit constitute the high seas, the United States could take no action based on Panama's claim to jurisdiction over them; and as the rights of Panama in the event a future permanent delimitation of the Zone should place Manzanillo Bay in Panama could be adjusted at that time, without, in the meantime, any injury to Panama's interests, the landing of the cable was permitted, and it is now in operation.

Transportation of Panama prisoners through the Canal Zone.—It is necessary for the Panama Government, in transporting prisoners between Panama and Colon, to send them through the Canal Zone, in charge of police officers. It has been the practice of the secretary of foreign affairs of Panama to notify the executive office in each case of the necessity of sending prisoners through the Zone. To such notices it has been customary to reply that authority is granted for the police of Panama to transport the prisoners through the Zone.

Recently the secretary of foreign affairs of Panama called attention to the wording of these replies, stating that the Canal Zone authorities are notified of the transit of prisoners of the Republic through the Zone in order that they may know that the prisoners are not in the enjoyment of their liberty, and may render assistance to the police of Panama in charge of the prisoners in the event of necessity, and that the wording of these replies, if continued, might injure the rights reserved by the Republic in Article VI of the treaty.

Assuming that the secretary referred to the provision of Article VI, that the grants contained in the treaty should not interfere with the rights of way over the public roads passing through the Zone, I advised him that I understood that this provision was intended to secure unrestricted passage to all persons over the public roads of the Zone where such passage would not conflict with the rights granted to the United States; but that I did not understand that it was intended to reserve, in police officers of Panama, the right to exercise their functions on such roads. No further communication on the subject has been received.

Panama street railway.—In April, 1905, the municipal council of Panama advertised for bids for a franchise to build and operate a street railroad in that city. Mr. Henry T. Cook was the successful bidder. His bid was accepted by the municipal council March 13, 1906, and a contract, under the terms of the franchise, was entered into by him with the municipal council of Panama on October 31, 1906. The contract authorized him to construct and operate, upon certain specified streets in the city of Panama, a street railroad, and also upon other streets at such times as the traffic might require it.

Under the contract Mr. Cook was required to keep in good condition the part of the street between the two rails of the track and 2 feet on either side of the track. He was also required to deposit in the municipal treasury $5,000, or negotiable securities of the value of $10,000, to guarantee the fulfillment of the contract.

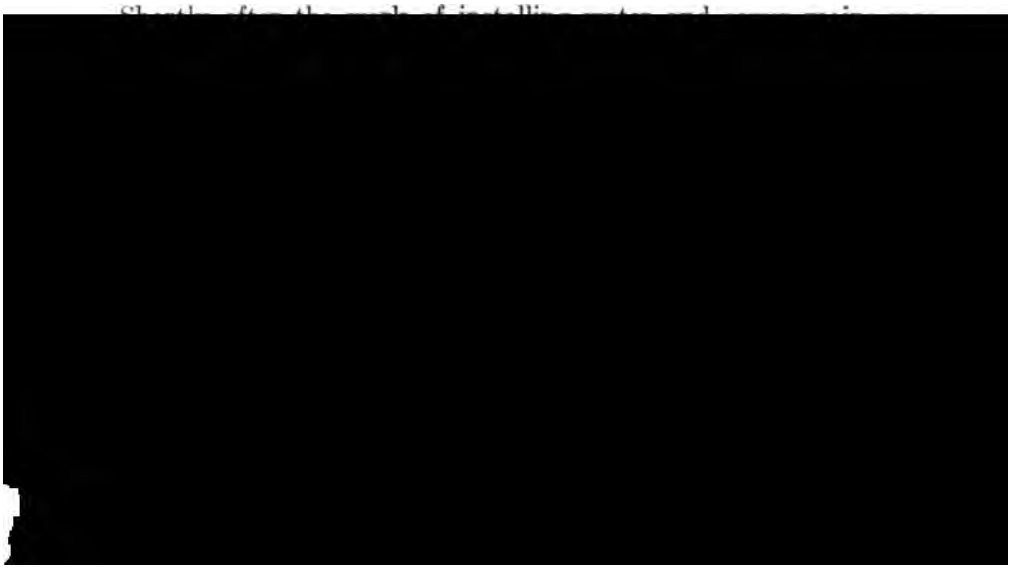
As the Canal Commission had paved the streets of Panama as a sanitary measure, and no arrangement had been made to reimburse the United States for the expenditure incurred, it had an interest in the pavements, and Mr. Cook opened negotiations with the Commission for the purpose of securing its permission for the construction of the railroad through the streets paved by the Commission. He was informed by the chairman of the Commission that the Commis-

sion would consent to his constructing the railroad through the paved streets upon his filing a bond in the sum of $25,000, conditioned upon the proper repair and maintenance of the streets. Mr. Cook declined to do this and commenced the construction of tracks, first upon an unpaved street and subsequently upon a paved street. When he commenced to tear up a paved street the attention of the Panama Government was called to the fact, and that Government was requested to enforce the provisions of a decree published by it May 25, 1906, at the instance of the Commission, providing that no person shall excavate any paved or macadamized street for any purpose whatever without first filing an application for permission to do so and making a cash deposit to cover the estimated cost of taking up the paving or macadam, refilling the excavation, and replacing the pavement or macadam in its original condition. The amount of the bond requested of Mr. Cook by the Commission—$25,000—was the estimated cost of this work, which would be made necessary by the construction of the railroad on paved streets. The Panama Government enforced the decree and work on the railroad has been discontinued.

Mr. Cook has made several requests for permission to construct an electric railroad in the Canal Zone to be operated in conjunction with the railroad to be constructed in Panama. The Commission has recommended a revocable license for the construction of this railroad, providing Mr. Cook is able to satisfy the Secretary of War of his financial ability to do the work. No action has been taken by the Secretary up to the present time.

Waterworks, sewers, and pavements in Panama and Colon.—Under the canal treaty the United States was authorized to construct waterworks and sewers as sanitary measures and to perform other sanitary work in the cities of Panama and Colon. The treaty provided that—

> all such works of sanitation,, collection and disposition of sewage, and distribution of water in the cities of Panama and Colon shall be made at the expense of the United States, and the Government of the United States, its agents or nominees, shall be authorized to impose and collect water rates and sewerage rates which shall be sufficient to provide for the payment of interest and the amortization of the principal of the cost of said works within a period of fifty years.



Contracts with Panama on the subject of the Panama and Colon water rates are now pending and will be closed within a short time.

Street cleaning in Panama and Colon.—Among other sanitary works, the Government has been sweeping the streets of Panama and Colon and removing garbage therefrom. Negotiations have been in progress for some time for the transfer of this work to the Panama Government, and it will be transferred September 1, 1907.

Importations by employees.—Under the Executive orders of December 3, 1904, and January 7, 1905, respecting imports into the Canal Zone, which were agreed to by Panama, employees of the Commission are authorized to bring in, free of duty, articles for their personal use.

In order to facilitate the shipment of these articles and to reduce as much as possible the trouble of handling them, an agreement was made with Panama for the use of a form of declaration to be made out by an employee and sent to the head of this department. Copies of the declaration are forwarded by the head of the department to the secretary of the treasury of Panama, the general manager of the Panama Railroad Company in Colon, as his authority for delivering the shipment, upon its receipt, without the collection of duty upon it, and the New York office of the railroad for use there in making up the ship's manifest. This system has worked satisfactorily.

During the fiscal year 436 requests for free admission of shipments of employees were received and approved.

Delimitation of the Canal Zone.—The treaty provides that the Canal Zone shall extend from the 3-mile limit in the Atlantic Ocean to the 3-mile limit in the Pacific Ocean and to the distance of 5 miles on either side of the center line of the canal. By the agreement entered into by General Davis, then governor of the Canal Zone, and representatives of the Panama Government, on June 15, 1904, the limits of the Zone were provisionally determined with reference to the center line of the sea-level canal projected by the French canal company. In a few localities, where it became necessary in order to settle questions pending, the provisional limits were located and marked, by joint action of the Zone authorities and Panama. When the center line of the lock canal to be built by the United States was located it became possible to determine and locate the permanent boundary lines of the Zone. Maps were therefore prepared by the Canal Commission showing the proposed permanent boundary lines, and were submitted to the Panama Government, which accepted them. Joint parties under the direction of engineers representing Panama and the United States, were put in the field for the purpose of locating the lines as shown on these maps. The lines which have now been located consist of a succession of tangents instead of curves, as did the provisional boundary lines. It is proposed to mark them by concrete monuments at the intersection of the tangents and by monuments of iron pipe at points where the boundaries intersect streams and roads.

The provisional boundaries of the cities and harbors of Panama and Colon, which are excepted from the Canal Zone by the canal treaty, are still observed. It is hoped that within a short time it will be possible to agree with Panama upon the permanent boundary lines of these cities and harbors, thus closing up the entire question of boundaries.

Extradition.—Under the extradition arrangement with Panama, reported in the last annual report of the governor of the Canal Zone, 34 requests have been made by the Zone authorities for extradition from Panama to the Zone, and 15 requests by the Panama authorities for extradition from the Zone to Panama. In many cases it has been impossible to locate the persons whose extradition has been requested. The arrangement has worked satisfactorily.

Extradition to other countries than Panama.—In May the American minister at Panama notified the Zone authorities that he had been requested by the American minister at Quito to have detained an American wanted in Ecuador for the alleged embezzlement of funds of a railroad company. The American was arrested by the Zone police upon his arrival at La Boca. Through his attorney he sued out a writ of habeas corpus, and upon the hearing of the writ he was discharged on the ground, first, that the offense with which he was charged was not extraditable under the treaty of the United States with Ecuador, and, second, that the procedure required by the extradition laws of the United States had not been complied with.

While the point was not made at that hearing, I am of opinion that the extradition laws and treaties of the United States do not apply to the Canal Zone, and that there is no authority for the extradition from the Zone to any foreign country having an extradition treaty with the United States of fugitives from justice of such country. The extradition laws and treaties of the United States were extended to the Philippines by act of Congress, and it is believed that it would be advantageous to have them extended to the Canal Zone by Executive order.

DEPORTATIONS.

In the President's letter of instructions of May 9, 1904, addressed to the Secretary of War, he authorized the Commission to exclude and deport from the Canal Zone certain undesirable classes of persons. This authority was referred to in the last annual report of the governor of the Canal Zone.

By a resolution of the Commission adopted February 20, 1905, the authority to act for the Commission in executing this provision of

RELATIONS WITH FOREIGN CONSULS.

With the importation of laborers from European countries the consuls of those countries in Panama have shown considerable activity in their behalf, and the work of the executive office relating to them has materially increased.

Complaints made by the consuls usually fall into one of three classes: (1) Those relating to errors in adjusting accounts of the laborers; (2) those relating to their food and quarters, and (3) those relating to differences with foremen on the work.

Complaints of the first class are due in most cases to the inability of the laborers to speak or understand English and to their disposition to change constantly from one locality to another, often with a change of name.

Those of the second class, when they are well founded, are due to the inability of the Commission to get efficient servants for the messes and kitchens, delays in train service, and short or poor food supply.

Complaints of the third class have their origin almost invariably in the inability of the foremen and men to understand and speak with one another.

Few of the complaints involve questions of importance even to the laborers themselves, but they are often magnified in the minds of the men into serious grievances.

Conditions are constantly improving among European laborers, however, as they become more accustomed to life on the Isthmus, and more convinced of the purpose of the Commission to treat them fairly. It is believed that the solution of the situation lies in securing their full confidence. This can be accomplished most easily by appointing foremen over them who speak their language, and by investigating fully, fairly, and promptly every complaint they make. This investigation of complaints will now be made, under the chairman's direction, by the secretary of the Commission. It would be of great convenience generally, and would assist especially in making investigations, if a card record of the laborers were kept, similar to that kept of American employees.

Considerable activity was manifested on several occasions during the year by representatives of certain South American countries, and of companies operating in those countries, in recruiting labor on the Isthmus. Efforts on the Isthmus to dissuade these persons from carrying on their operations were in most cases unavailing. In a few instances persons under contract with the Commission to repay the cost of their transportation to the Isthmus were prevented, by ne exeat proceedings, from leaving, where it was possible to say that they were indebted to the United States. Little, however, was accomplished by this means, and the matter was referred to the Secretary of War by the chairman of the Commission, to be taken up by the State Department. Recruiting operations have now practically stopped. It is believed that this is the result not so much of any effort here to prevent them as of the fact that the laborers taken to South America have not found conditions satisfactory and have reported that fact to their friends upon the Isthmus.

OFFICE BUILDINGS.

It was decided several months ago to adapt the building under construction and originally intended for the residence of the governor of the Canal Zone for use as a general office building. It is hoped that by the 1st of January, 1908, it will be possible to remove into it all of the general offices of this department except those of the chief of the fire department and superintendent of public works. While it is desirable that the offices of this department should be near Panama, to facilitate communication with officials of the Panama Government, yet it is equally desirable that they should be located in Canal Zone territory.

It has been suggested that the present administration building in Panama, where the offices of the department now are, should be sold. This may be possible eventually, but for the time being it will be necessary to retain the building for use as offices that for the sake of convenience should be located in the city of Panama.

The removal of the disbursing office back to Panama was suggested, on account of the greater convenience of having the office here in conducting negotiations with local bankers. It has been determined, however, to be inadvisable to make the change, on account of the fact that the jurisdiction of the Zone authorities does not extend to the building and they would therefore be unable to afford proper protection to funds in the building.

At Cristobal the local offices of this department will be brought together shortly in one of the "De Lesseps palaces" now being remodeled for use as an office building.

DEPARTMENT OF REVENUES.

The department of revenues, which is under the direction of the collector of revenues, includes the divisions of posts, customs, revenues, lands and buildings, and administration of estates.

Division of posts.—There are now 16 post-offices in the Canal Zone, located at the following towns:

La Boca. Bas Obispo. Ancon. Matachin.

estimated that 75 per cent of the mail is handled under Government frank, from which, of course, the post-offices derive no revenue. It is believed that if the postal division were credited with regular rates of postage for mail handled under Government frank, as is done generally when one department of the Commission performs work for another, the postal division would not only be self-supporting, but a large profit, considerably in excess of the present postal revenues, would result. At the present time, if the postal division requires any printing the division of material and supplies performs the work, charging the postal division for the cost of material and labor, plus 20 per cent; yet that division distributes a large part of the output of the Commission's printing office under Government frank, and the postal division receives no credit for handling and delivering it.

During the year ended June 30, 108 dispatches of mail were made to New York, 28 to New Orleans, 32 to Trinidad, 49 to Jamaica, 34 to Barbados, 14 to Bordeaux, France, and the French West Indies, and 16 to Port Limon.

The growth of the registry business has kept pace with the growth of the postal business generally. The registry business increased 30 per cent during the last six months of the fiscal year over the first six months of the year. About 40 per cent of the registry business handled is under Government frank, practically all papers relating to timekeeping and the disbursement of funds being passed between the disbursing office and the different departments by registered mail. A statement is attached showing the extent of the registry business for the fiscal year ended June 30, 1907.

The money-order system of the Canal Zone was organized June 1, 1906, and has therefore been in operation thirteen months. During the month of June, 1906, 1,611 money orders were sold, aggregating $50,067.15; in June, 1907, 9,532 money orders were sold, aggregating $281,415.31. With one exception the money-order business has shown an increase from month to month. The statement accompanying this report shows the number and amount of money orders sold, the amounts drawn on points in the Canal Zone, and the amounts drawn on the United States and foreign countries. Outside the cities of Panama and Colon there are no banking facilities on the Isthmus, and employees of the Commission stationed at points on the line of the canal frequently purchase money orders to secure a safe depository for their funds. The amount of money orders paid in the Canal Zone has, during each month, been less than the amount of those purchased for payment in the Zone, and the difference probably represents the savings of employees. Efforts have been made to advertise by circular and otherwise the money-order system among the European laborers imported by the Commission, in order that they may avoid the payment of large rates of exchange. The fee for an order of $100 issued in the Canal Zone for payment in Italy is $1.33, which is considerably less than the usual banking rate of exchange.

The work accomplished by the postal division has been performed at times under great difficulties. The present personnel is numerically inadequate, and efforts have been made to supplement it by transfers from the postal service of the United States. The desire is to have in the post-offices of the Canal Zone only persons trained in

post-office work in the United States. It has not been possible, however, to secure the necessary number of such persons, but as the Civil Service Commission at Washington has recently approved the transfer of several experienced clerks it is hoped soon to bring the force up to the required number.

There are at the present time seven post-office buildings in use which were built by the Canal Commission especially for that purpose, located at the following points: La Boca, Pedro Miguel, Culebra, Empire, Gorgona, Las Cascadas, and Gatun.

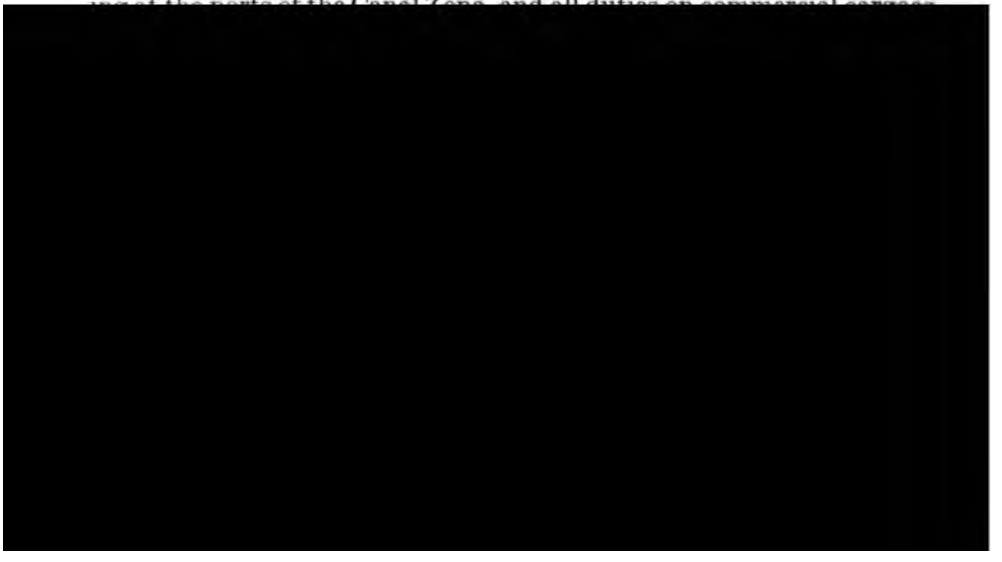
Buildings built for other purposes have been repaired and adapted to post-office work at the following points: Ancon, Corozal, Paraiso, Matachin, Bas Obispo, San Pablo, Bohio, Tabernilla, and Cristobal; and plans are in preparation for the construction of a large modern post-office building at Cristobal, the exchange office of the Canal Zone, as the building now occupied there does not meet the present requirements.

Division of customs.—There are two customs districts and two ports of entry in the Canal Zone—Ancon on the Pacific side and Cristobal on the Atlantic side—created, respectively, by Presidential orders of June 4 and December 3, 1904.

Practically all of the vessels arriving at the Isthmus on the Pacific side now enter the port of Ancon. At the port of Cristobal there were no docking or terminal facilities when that port was opened, but there have since been constructed docks equipped with modern appliances, and the railroad has extended the necessary tracks. The vessels of the Panama Railroad Steamship Line, and many others which formerly cleared for the port of Colon and entered Cristobal by clearance from Colon, now clear from port of first departure direct for Cristobal.

During the year ended June 30, 116 vessels, of a gross tonnage of 203,147 tons, entered the port of Cristobal, and 113 vessels, of a gross tonnage of 196,817 tons, cleared from that port. At Ancon 163 vessels, of a gross tonnage of 274,656 tons, entered, and 162 vessels, of a gross tonnage of 274,870 tons, cleared from that port.

Under the Executive order of the Secretary of War, issued by direction of the President on December 3, 1904, no duties, tolls, or fees of any kind are charged for services rendered vessels entering and clear-



The act also provided that the Internal-Revenue Service "shall be regulated and controlled in like manner and extent as is prescribed by the laws, rules, and regulations of the Internal-Revenue Service in the United States, not inapplicable to the conditions of law and fact existing in the Canal Zone."

No law has yet been enacted fixing the rates of taxes on distilleries, nor any rules or regulations prescribed for measurement or operation of stills in the Canal Zone, and the law of Panama in force on February 26, 1904, governing the licensing and operation of distilleries is observed and enforced. The distillation tax is $6 (Panama currency) per liter capacity per month of thirty working days, for a continuous apparatus, and $3 (Panama currency) per liter capacity per month of thirty working days, for a simple apparatus. Distillation licenses to the amount of $5,189.95 were collected during the year ended June 30, 1907.

The order of the President abolishing the municipalities provided that the collector of revenues shall have charge of the collection of taxes and licenses and all other forms of collections previously made by the municipalities, and on April 15, 1907, there was added to the personnel of the revenue department a force of four district tax collectors, one for each district, and five assistants, two assistants being assigned to the most populous district.

Division of lands and buildings.—This division has charge of the leasing of building lots and agricultural lands and buildings owned by the United States which are not required for Commission purposes.

The number of agricultural leases during the year has decreased, instead of increasing, as was expected. The reason for this is not apparent, unless it is that the returns from agricultural ventures are slow and require an amount of capital which the smaller investor who would engage in independent agricultural pursuits in the Tropics is not prepared to furnish; doubtless it is also partly due to the fact that remunerative employment can always be secured on the canal work. The reduction in the number of leases has been due to some extent to the cancellation of leases on watersheds draining into reservoirs which furnish the water supply for towns and villages on the Isthmus. Three watersheds have been entirely cleared of human habitation and no leases are now made in the vicinity of reservoirs without reference to the sanitary department for approval as to location.

During the past dry season a number of roads and trails were opened in the administrative districts of Ancon, Emperador, and Gorgona, and there is every reason to believe that the number of agricultural leases will increase during the present year, as there is now available a large amount of valuable agricultural land which has hitherto been inaccessible. The total number of leases for building lots in force on June 30, 1907, was 479, and for agricultural lands 83, the leases for agricultural lands covering 344 hectares of land.

As stated in the first annual report of the governor of the Canal Zone, about 52 square miles of land in the Zone were purchased by the United States from the New Panama Canal Company, and about 189 square miles were acquired from Panama under the treaty. Much of this land will be required for canal construction purposes, and a large part of it will be submerged by the lakes formed by the canal.

The authority for leasing this land is found in the act of Congress approved July 28, 1892, authorizing the Secretary of War to lease,

for a period not exceeding five years and revocable at any time, property of the United States under his control and not required for public use.

The land laws of the United States do not apply to the Canal Zone, and the land laws of Panama in force in the Zone at the time of its cession to the United States are not applicable to the conditions in the Zone. It is believed that as soon as it is possible to determine with reasonable certainty the lands that will be required for canal purposes on the Isthmus, the remaining lands should be opened to cultivation and settlement under some arrangement that will assure permanent tenure to persons desiring to secure it. A great deal of public land in the Zone is occupied by squatters, who have been on the land for many years without legal right. These persons are not disturbed, except where their occupation of the land interferes with canal work.

Considerable land in the Zone claimed by private persons is, it is believed, actually public land. As it becomes necessary from time to time to occupy it for public purposes the titles to such land will be adjudicated in the courts. The new code of civil procedure provides a simple method of testing titles in such cases.

Administration of estates.—Under act No. 24 of the Isthmian Canal Commission the collector of revenues is ex officio administrator of estates for the Canal Zone where the decedents were citizens of the United States and employees of the Isthmian Canal Commission or the government of the Canal Zone and the estates consist entirely of personal property not exceeding in value $500 United States currency. Twenty-nine estates were settled during the year ended June 30, 1907.

By an Executive order dated June 22, 1907, the Secretary of War extended the provisions of act No. 24 to include employees of the Panama Railroad Company.

It is but just to say that the administration of the various branches of the department of revenues, including posts, customs, revenues, lands and buildings, and the administration of estates has been eminently satisfactory and efficient.

MUNICIPALITIES.

By legislative action of the Canal Commission in September, 1904,

to the native inhabitants of the Zone, who had been accustomed always to bring the most trivial incidents of their lives to the local officials for adjustment. The removal of the municipal officials would have been a distinct hardship to those people but for the fact that in every district municipal officials were continued as officers of the Zone in the organization created when the municipalities were abolished. But, notwithstanding that fact, the people constantly bring their grievances and complaints to the executive office.

When the municipalities were abolished the collection of taxes previously collected by them was turned over to district tax collectors, reporting to the collector of revenues, district judges were provided for in place of the municipal judges, and the Commission was given authority to enact ordinances on subjects on which the municipal councils had previously legislated.

While the municipal governments were very satisfactory, yet it is believed that the present form of government, with administrative districts, will prove more so when it has been in operation sufficiently long to enable the officers of the government and others to become familiar with its form and powers.

Immediately after the signing of the order reorganizing the Canal Commission, on November 17, 1906 (which provided for the separation of the department of government from the department of sanitation), and the appointment of the head of the department of law and government, plans were made for the abolishment of the municipalities; but the required Executive order of the President was not signed until March 13, 1907, and did not become operative until April 15, 1907. During the period November 22, 1906, to April 15, 1907, the activities of the municipalities were confined to the routine matters and the enactment of the necessary appropriation ordinances. The construction of roads and trails, for which work there was on hand in each of the municipal treasuries a considerable balance, was carried on under the direction of the superintendent of public works.

ZONE FUNDS.

The abolishment of the municipalities of the Zone and the provisions in the act of Congress of March 4, 1907, respecting the use of Zone funds, have given rise to some difficulties along this line. The officers of the municipalities collected and disbursed municipal funds; for the purpose of safe-keeping they were authorized to deposit surplus funds with the Zone treasurer. There had always been certain Zone funds in addition to the municipal funds, which had been held and accounted for by the Zone treasurer. Those included internal-revenue taxes, supreme court costs, and circuit court costs and fines, postal revenues, etc. From them the Secretary of War authorized the payment of the expenses of the school system of the Zone and certain miscellaneous and contingent expenses. The act of Congress of March 4, 1907, authorized and directed the use of money collected in the Zone and in the cities of Panama and Colon, by the Zone government, from the rental of lands and buildings, the postal service, court costs and fines, and taxation, to be used (1) for the creation of a miscellaneous and contingent fund for the Zone of $10,000; (2) for public works and schools of the Zone, and (3) for the postal service—the postal revenues alone, however, to be applied to that service.

This provision of the act of March 4 and the provisions of the Executive order of March 13 abolishing the municipalities resulted in the following classes of Zone funds:

(1) Municipal funds on hand March 4.

(2) General Zone funds on hand March 4.

(3) Municipal funds collected between March 4 and April 14, inclusive, and all other general Zone funds collected on and after March 4.

(4) Postal funds on and after March 4.

From the funds of the first class were paid all municipal expenses incurred up to March 4, and all municipal expenses, except those incurred for public work, from March 4 to April 14, inclusive, the balance of those funds being held subject to appropriation by the Commission for such purposes as the fund could have been used for by the municipalities before they were abolished.

From the funds of the second class were paid the expenses of the school system and miscellaneous and contingent expenses of the Zone government up to March 4, under allotments made for those purposes by the Secretary of War, the balance of those funds being held subject to appropriation by the Commission for Zone purposes, upon approval of the Secretary of War.

The funds of the third class can be used by the Commission only for public work, schools, and contingent expenses, and the funds of the fourth class can be used by the Commission only toward defraying the expenses of the postal service.

As a treasurer of the Zone has not yet been appointed, the disbursing officer of the Commission acts as treasurer for the Canal Zone under the laws of the Zone.

The Commission's auditor on the Isthmus audits the accounts of the Canal Zone, and for that purpose exercises with reference to those accounts the authority of the Auditors and Comptroller of the Treasury.

COURTS.

Figures showing the number of cases tried in the various courts of the Zone during the year are included in Appendix 3.

Among the decisions of importance rendered by the supreme court during the year was the decision in the Coulson case, in which the

have one vote on such questions. The concurrence of any two is decisive of the question passed upon. The circuit judge determines questions of law.

Coulson's attorneys moved for a trial by jury, as a right guaranteed by the Constitution of the United States. The court denied the motion, and an appeal was taken from the verdict of guilty to the supreme court of the Zone, which affirmed the decision of the circuit court. Coulson's attorneys, it is understood, propose to attempt to have the question of the legality of his conviction passed on by the Supreme Court of the United States.

The decision of the supreme court in the Andrade case was also important. That was a case of ejectment, brought in the name of the United States against Andrade, to recover possession of lands occupied by him. The Government claimed that the lands were at the time of the signing of the canal treaty public lands of Panama, and were acquired by it under the treaty. The defendant, who was in possession of the lands, pleaded the statute of limitations, and argued that the Government must prove its title to the land.

The court held that the statute of limitations does not run against the Government, and that the burden is always upon a person claiming adversely to the Government to prove title. The importance of this decision lies in the fact that a great deal of land in the Zone supposed to be public land is claimed by private persons. The case was tried and the decision rendered under the code of civil procedure of Panama in force at that time in the Canal Zone. The new code of civil procedure, which was not then in force, provides specifically for the rights of the Government as they were held by the court under the former code of civil procedure.

The number of cases in the circuit courts tried during the year was considerably larger than the number for the preceding year, especially on the criminal side.

Additional duties were placed upon the clerks of the circuit courts by the executive orders respecting marriage and the registration of land titles.

The municipal courts were abolished by the order of March 13, which provided for the appointment of district judges to exercise the authority and discharge the duties of the municipal judges.

The duties of these district judges are very important. They try from 500 to 600 criminal cases a month, and upon them depends in a large measure the enforcement of law in the Zone. They combine the functions of a country justice of the peace in the United States with those of a city recorder. The dignity and responsibility of the office and its importance in the scheme of government provided for the Zone are being recognized more and more as time goes on.

POLICE DEPARTMENT.

In addition to his duties as head of the police department, the chief of police discharges the duties, by himself and through his subordinates, of marshal of the courts of the Zone, warden of the Zone penitentiary, and coroner of the Zone.

On July 1, 1906, the strength of the police department was 221 officers and men and 6 clerks, and on June 30, 1907, the force consisted of 181 officers and men and 7 clerks. Of the men on the force

on July 1, 1906, there were 59 white and 162 colored, and on June 30, 1907, 91 white and 90 colored. It was reduced from 245 members on October 31, 1906, to 171 on January 31, 1907.

There is appended to this report a statement, by months, of the force and pay rolls of the police department for the fiscal year 1906–7.

The importations by the Commission of European laborers for work on the canal soon made it necessary to increase the force. It was found necessary in handling European laborers to have a force composed largely of white officers, as the European laborer objects to control, correction, or arrest by colored policemen.

The enlisted force of the police department was composed during the year of the following ranks: Policeman, $40 per month; first-class policeman, $75 per month; corporal, $80 per month; sergeant, $100 per month; first-class sergeant, $125 per month.

The policemen are negroes from the West Indies, and most of them have served in the constabularies maintained by the governments of the islands.

The position of first-class policeman is filled only by white officers. Almost all of them are American citizens who have had military experience.

The ranks of corporal, sergeant, and first-class sergeant are filled by promotion from the grade of first-class policeman.

The salary paid first-class policemen during the year was $75 gold per month. This was found inadequate to maintain a permanent force of those officers, as salaries in other lines of work under the Commission are higher, and the police force continually lost competent police officers who resigned to accept employment in other departments of the Commission.

It was necessary during the year, in order to maintain the force of white officers, to include in the contract of employment with those brought from the United States, a clause providing that they should not be eligible to appointment in any other branch of the Commission's work on the Isthmus until they had completed one year's service in the police department. Effective August 1, a new scale of salaries, with increases, went into effect, and it is expected that it will remove many of the difficulties that have been experienced in keeping an

order among them comparatively easy. But the European laborers, restless, suspicious, and excitable, constitute a class very different in temperament and character from the West Indian laborers. The maintenance of order in the Zone became, with the influx of these people, more difficult.

Arrests for intoxication, disorderly conduct, fighting, and crimes of violence have continued to increase as the number of European laborers on the Isthmus has increased.

During the year ended June 30, 1907, ten stations and jails have been constructed and three lockups built for the police department. But four buildings which were adapted for temporary police use are now used as jails, their locations being La Boca, Corozal, Paraiso, and Bohio. All other jails and police stations in the Zone were constructed for police purposes, and have been erected since the organization of the government of the Canal Zone.

The work of the police department includes many duties not ordinarily assigned to a police force. Much of the work ordinarily performed by watchmen in connection with shops, warehouses, and other similar buildings is in charge of the police, and police guards are furnished for the disbursing officer, his paymasters and pay cars, and the passenger trains of the Panama Railroad Company.

Satisfactory relations have been maintained between the police departments of the Zone and of the Republic of Panama, and the departments have cooperated to reduce crime on the Isthmus to a minimum.

There were 45 convicts confined in the Zone penitentiary on July 1, 1906; 85 convicts have begun penitentiary sentences during the year ended June 30, 1907, and there were 82 convicts in confinement on June 30. Pardons were granted during the year to 5 convicts in the Zone penitentiary.

There are appended to this report six tables of statistics respecting the Zone penitentiary.

The work performed by the convicts has amounted to over 57 per cent of the cost of their maintenance.

The Culebra Jail has been used as a penitentiary since its completion, but, due to the crowded condition, it was necessary, in May of this year, to transfer all short-term prisoners from Culebra to the jail at Gorgona, pending the completion of an annex to the Culebra Jail, which will be used permanently as a penitentiary. The annex is now about 90 per cent completed.

In the discharge of his duties as marshal of the supreme and circuit courts, the chief of police reports that there have been 310 summonses, 663 subpœnas, and 4 executions served.

The chief of police, acting as coroner, has, during the year ended June 30, 1907, held inquests over 136 bodies. The most frequent cause of death resulted from railroad accidents, 58 being attributable to that cause; 28 deaths resulted from drowning.

When we consider the embarrassment that surrounded the organization of the Zone police force (the employment of both whites and blacks in nearly equal numbers; the fact that the white element was drawn largely from various sections of our own country, and that the second-class policemen consisted exclusively of a foreign element; that an organization had to be effected; that rules and regulations had to be adopted and put into practice; the liability of [illegible] or

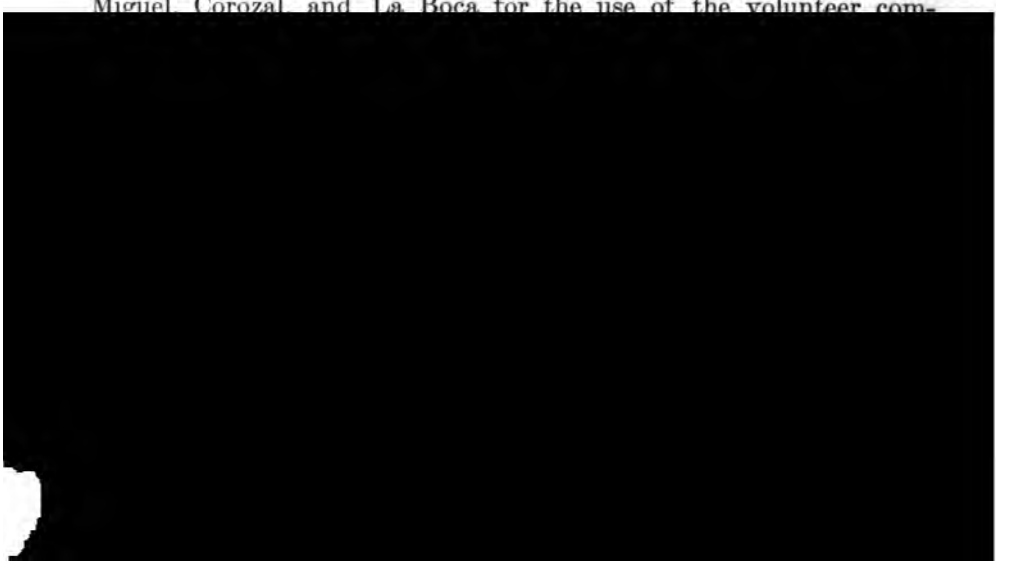
hourly impingement between the Zone police and those of the Republic of Panama in both the cities of Panama and Colon, and the difficulty, even the apparent impossibility, of avoiding clashes, and the overlapping of one jurisdiction by the police force of the other), the record furnishes the most conclusive evidence as to the capacity, tact, and efficiency with which this work has been accomplished.

FIRE DEPARTMENT.

The fire department was organized along the lines stated in the last annual report of the Commission. In November, 1906, a sufficient number of trained firemen from the United States had arrived to place in commission all the apparatus at Cristobal, which included a hose wagon, a chemical engine, a hook-and-ladder truck, and a steamer. In February of this year the building for the paid department at Ancon was completed and the apparatus, consisting of a combination chemical and hose wagon, carrying a 16-foot extension ladder, was installed. Paid firemen have also been stationed at La Boca, Culebra, Empire, and Gorgona. These men are in charge of the volunteers at their stations, and also inspect fire extinguishers, hose, and other apparatus.

The paid members of the fire department are men who have served as firemen in paid departments of the larger cities of the United States. Difficulty has been experienced in securing firemen from the United States, and the department is at present undermanned. The force of the department and its distribution on June 30, 1907, was as follows: Cristobal, chief of the department, 1 clerk, 10 firemen, 1 helper (laborer); Ancon, 5 firemen; Gorgona, 1 fireman; Culebra, 1 fireman; Empire, 1 fireman; La Boca, 1 fireman.

During the present year additional paid companies will be established at Ancon, Culebra, Empire, and Gorgona, and electric fire-alarm systems will be installed at all those places. Two fire stations have been constructed for paid departments—the one at Cristobal and the one at Ancon. Fire stations have been constructed at Gatun, Gorgona, Las Cascadas, Empire, Culebra, Paraiso, Pedro Miguel, Corozal, and La Boca for the use of the volunteer com-



There are no paid fire companies in the cities of Panama and Colon, and the fire protection of those cities is intrusted entirely to volunteer companies. It has been necessary on occasions during the past year, in order to protect Government property situated in those cities, for the Canal Zone fire department to assist the Panama and Colon volunteer companies.

A table is appended to this report showing the number of fires, by months, for the nine months ended June 30, the total losses resulting, and the amount of loss sustained by the Government. From this table it will be seen that one fire, that of the Mount Hope storehouse, on April 1, resulted in serious loss to the Government. Mount Hope is only a mile from Cristobal, but the fire department at Cristobal was delayed in reaching the fire because of the necessity of securing an engine and flat car to take the equipment there by rail. A wagon road from Cristobal to Mount Hope, at that time in progress, has since been completed, and the storehouse is now protected. The small loss resulting from the other fires is due to the fact that they were discovered in their incipiency and were promptly extinguished by the use of chemical extinguishers. The chief of the fire department estimates that the total amount of property involved in all the fires occurring during the period named is $1,300,000 United States currency.

The estimated cost of the fire department for the fiscal year ending June 30, 1908, is $114,958.32. The cost of the new buildings constructed by the Commission to date is approximately $8,255,837. Without including the cost of other buildings which were on the Zone when the work of canal construction was commenced, and without including the cost of materials protected, the rate of insurance, taking the cost of the department as the premium, would be 1.39+ per cent. This rate is reasonable, when compared with the insurance rates prevailing in most cities in the United States; the rates of insurance in the city of Panama are from 2 to 4 per cent and in the city of Colon from 6 to 8 per cent. In both cities higher rates than those named are charged for extremely dangerous risks. Another feature to be considered in insurance rates is the fact that all the buildings constructed by the Commission in the Zone, with a single exception, are frame buildings, of light construction.

In order to secure additional protection for the docks at Cristobal and Colon, turrett nozzles have been placed on two steam tugs belonging to the Panama Railroad Company and the Commission, and similar equipments will be installed on the steam tug *Bolivar* belonging to the railroad company, and used in the ports of Ancon and Panama.

A 10-box alarm system for Cristobal and vicinity has been installed and is kept in order by the electrician stationed at fire headquarters. Frequent tests are made.

Three-gallon chemical extinguishers have been placed in all buildings belonging to the Government. There are now 918 in use. These extinguishers are regularly inspected weekly at points where paid firemen are stationed and biweekly at other points. Hand grenades are also placed in Government buildings, and during the year ended June 30, 1907, 668 were distributed. Regular inspections of all Government buildings, including those under construction, are made by members of the fire department to see that inflammable matter is not

permitted to accumulate unduly or the risk of fire unnecessarily increased. In special cases inspections are made daily. The great freedom from fires in the Zone must be in some measure attributed to these inspections maintained by the fire department.

The value of the work of the fire department can never be accurately known, because the incipient or small fires are simply reported as small fires, with a loss of $5 or $10, when, but for the work of the department, they might have developed into large fires resulting in considerable loss and great inconvenience.

With the most efficient organization possible, however, and with every possible precaution, it is still to be expected that fires will occur.

PUBLIC WORKS.

When it was first proposed to turn over to the department of government the maintenance and operation of the Panama and Colon water and sewer systems, the position of water commissioner was created, to have charge of that work. In November, 1906, the position of superintendent of public works for the Zone was created, to include the duties of the water commissioner, and by the executive order of March 13, 1907, the superintendent of public works was given charge of the maintenance and operation of slaughterhouses, markets, and other public work in the Zone paid for from local funds.

The work of the superintendent of public works includes the maintenance and operation of the water and sewer systems and paving in the cities of Panama and Colon; the collection of water rents from private parties supplied with water from the water systems constructed for Commission purposes in the Zone; the inspection of plumbing in the Commission buildings in the Zone; the construction of roads and trails, and other public improvements in the Zone; the operation and maintenance of slaughterhouses and markets; supervision of street lighting in the villages of the Zone, and the maintenance of public buildings formerly used for municipal purposes and now used by the administrative district officials.

Operation and maintenance of water and sewer systems of the city of Panama.—The water and sewer systems of Panama were turned

the contract number being also attached to the meter for each connection.

On October 1, 1906, a Venturi meter was installed for the purpose of measuring water coming into the city of Panama, and daily readings of this meter have been taken since. On December 1, 1906, meters had been installed on all private connections, and since that time the Panama government has been paying the regular rate for water used for public purposes, the amount consumed being ascertained by subtracting the total amount of water used for private purposes, as shown by the meters on private connections, from the total shown by the Venturi meter. For the seven months ended June 30, 1907, the government of Panama had paid $4,486.20 United States currency net for water for public use. There are now 133 fire hydrants and 22 public taps for supplying water in the poorer districts of the city, a total of 155 street hydrants. The charge per hydrant per annum is therefore $49.68, a reasonable charge when compared with the rates prevailing in the cities of similar size in the United States.

The work of connecting houses with the mains has progressed rapidly since the date of the last annual report. On October 31, 1906, there were 713 connections and 164 applications, and on June 30, 1907, there were 1,023 connections and 97 applications.

It has not been necessary to take legal action to secure the collection of any bills for water rents during the past year, and most of the bills have been paid before the expiration of the discount period of fifteen days. Attached to this report is a table showing the consumption of water and collection of water rents in the city of Panama for the fiscal year ended June 30, 1907. It appears from this table that the per capita consumption is considerably less than in any city of similar size in the United States. This is attributable in part to the fact that there are no factories and few steam plants in Panama.

It was not possible, due to delay in receipt of meters from the United States, to install them on all private connections until December, 1906. A considerable economy in the consumption of water resulted after meters had been placed on private connections, as is shown by a comparison of the average daily consumption for the months of October to June, inclusive:

Month.	Average daily consumption.	Connections.	Number of connections metered.
1906.	*Gallons.*		
October	824,000	673	103
November	788,039	713	625
December	704,870	752	All.
1907.			
January	648,518	846	All.
February	661,143	893	All.
March	727,968	922	All.
April	724,266	963	All.
May	735,258	996	All.
June	749,800	1,023	All.

The water pressure in the city of Panama has at all times been satisfactory, and in case of fire it has amply met the requirements.

No work has yet been required in the maintenance of paving the city of Panama, and as there is no great amount of heavy traffic it is not expected that much work of this nature will be necessary other than that resulting from excavations in the streets for repairs to water and sewer mains.

Operation and maintenance of the water and sewer systems and street paving in Colon.—The water and sewer systems in Colon have not yet been turned over as completed to the water commissioner by the division of municipal engineering. The work of the water commissioner in that city has therefore been confined to the inspection of plumbing, the receiving of applications for service connections, and the collection of water rents. Although Colon has been supplied with water for more than a year, it was not possible, for want of sewers, to install plumbing in the houses there until March of this year. In March the installation of sewers had progressed sufficiently to begin the work of connecting the houses in a part of the city, and considerable progress has since been made. On December 31, 1906, there were 3 private connections paying water rent, and on June 30, 1907, there were 64. The net amount of bills rendered for the quarter ended June 30, 1907, was $1,427.30 United States currency.

Zone water systems.—The water systems of the Zone are those which have been installed by the Commission for its use in connection with the construction of the canal. Water is also furnished to the houses owned by the Commission and occupied by Commission employees and to the hotels owned and operated by the Commission. Where it has been possible to do so, extensions to these systems have been made and water has been furnished to persons living in the towns in the Zone outside of Commission camps and quarters. As water is furnished without cost to employees of the Commission living in quarters furnished by the Commission, the work of the superintendent of public works in connection with the Zone water systems has been limited to the collection of water rents from private consumers. On June 30, 1907, there were 36 private connections, and 34 bills were rendered for that quarter, the net amount of the bills being $484.45 United States currency.

Public improvements in the Zone.—During the dry season, extending from the latter part of December to the 1st of May, 37.31 miles of roads were constructed in the Zone. The character of the roads or trails varies with the territory through which they pass. The road from Culebra to Empire is a macadamized road, while the trails over the hills are usually but 6 or 8 feet wide, and are not passable for wheel traffic. The hilly nature of these sections makes it necessary, in handling agricultural products, to use pack animals, so that trails of this width answer every requirement.

The trails and roads constructed, briefly described, are as follows:

A 7-mile trail from the city of Panama into the Zone, following the old Cruces trail; a 5-mile trail from Pedro Miguel to Arraijan; a trail from Empire toward La Chorrera, in the Republic of Panama; a trail from Bas Obispo toward Cruces; a macadamized road from Culebra to Empire, and a trail from Empire to Gorgona, passing through the villages of Bas Obispo and Matachin.

Short connecting trails have also been built in the district of Ancon, and a 3-mile trail from Mount Hope to the interior of the district of Cristobal has been constructed.

There are 2 slaughterhouses under the direction of the superintendent of public works, located at Empire and Gorgona, and 3 markets, 1 each at Empire, Gorgona, and Cristobal. These properties are sources of considerable revenue to the Zone.

In order to take care of the increased slaughtering at Empire, a new slaughterhouse, farther from the village, is being constructed, and will be ready for occupancy by September 1 of this year.

The importance of the works described under this heading lies in the fact that they have been paid for entirely from funds raised by local taxation.

The work of construction of the Panama and Colon water and sewer systems and pavements will soon be completed, and in order to avoid the duplication of organization and duties it is proposed to confine the jurisdiction of the superintendent of public works to the work of inspection of water and plumbing in the Zone and the operation of slaughterhouses and markets; the actual construction work in connection with public improvements to be turned over to the engineering department, which is equipped for and is doing that class of work in connection with the construction of the canal. Under this division of duties the superintendent of public works will advise the head of the department of civil administration as to the most advantageous expenditure for local purposes of funds arising from local taxation. Request will then be made of the chairman for the execution of the work involved, which will be done, under the chairman s orders, by the engineering department.

SCHOOLS.

On December 1, 1906, the division of schools, which had been a part of the bureau of municipalities since May, 1906, was made an independent division. The average enrollment for the year was 1,643. The average attendance was 1,138—69+ per cent of the total enrollment. Schools were open during the year, or parts of the year, at the following points: La Boca, 4 rooms; Las Sabanas, 1; Pedro Miguel, 2; Paraiso, 1; Culebra, 3; Empire, 3; Las Cascadas, 1; Cruces, 1; Matachin, 2; Gorgona, 4; San Pablo, 2; Tabernilla, 1; Bohio, 3; Gatun, 2; Pleya de Flor, 1; Cristobal, 3; Chagres, 1; Frijoles, 1; Ahorca Lagarto, 1, and Cunette, 1 room.

The personnel of the division of schools on June 30, 1907, consisted of the superintendent, 1 clerk, and 31 teachers.

Considerable attention has been given by the Commission to the subject of schools in the Zone. New buildings have been authorized for white schools at Ancon, Las Cascadas, Paraiso, and Bas Obispo, and additions to the present school buildings at Gorgona, Empire, and Cristobal; and it is hoped that many, if not all of them, will be in condition for occupancy early in the coming school year.

The plan proposed and approved by the Commission contemplates the employment of teachers from the United States, of two grades, at salaries of $90 and $110 per month, respectively, for the schools to be provided for American and Panaman children; and for teachers from the West Indies at a salary of $60 per month for the schools to be attended by the children of West Indian laborers.

Great difficulty has been experienced during the past year in securing proper quarters for women teachers from the United States, and

it is believed that this arrangement of teachers will in a large measure overcome that difficulty.

It is also proposed that the schools for American and Panaman children shall be organized into grades, with the pupils carefully classified, and that as far as conditions on the Isthmus will permit, facilities will be provided for the children of American employees here as broad in scope and purpose as are those of the schools in the United States.

During the past year 24 schools were opened. Of the buildings used 5 were constructed for school purposes by the Zone government; 14 schools were conducted in buildings repaired and adapted for school purposes, and 5 were conducted in buildings leased from private parties and adapted to school purposes.

Conditions throughout the Zone government are very satisfactory. No changes have been made in the heads of divisions or other important officials since I assumed charge of the department. Most of the men in the department in important positions have been on the Isthmus for some time, several of them since the organization of the Zone government, and with a familiarity with the work and problems presented have developed an efficiency reflecting great credit on themselves and resulting in commendable work by their divisions.

Very respectfully,

JO. C. S. BLACKBURN,
Head of Department of Civil Administration.

The CHAIRMAN, ISTHMIAN CANAL COMMISSION,
Culebra.

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TABLE 1.—*Department of civil administration.*

Month.	Gold.		Silver.		Total employees.	Total salaries and wages.
	Monthly.	Hourly	Monthly.	Hourly		
1906.						
July	371	.....	23	22	416	$34,764.65
August	387	1	26	23	437	35,615.41
September	393	1	27	23	444	36,581.80
October	410	.....	25	28	463	37,693.93
November	416	.....	24	23	463	37,994.78
December	421	.....	23	14	458	31,255.76
1907.						
January	322	.....	45	4	371	30,917.37
February	329	.....	38	13	380	32,847.72
March	341	.....	31	19	391	31,839.67
April	361	.....	68	193	622	35,670.64
May	358	.....	52	257	667	41,885.00
June	355	.....	51	63	469	40,160.35
Total	.....	.....	.....	.....	.....	427,227.08

TABLE 2.—*Executive office.*

Month.	Gold.		Silver.		Total employees.	Total salaries and wages.
	Monthly.	Hourly.	Monthly.	Hourly.		
1906.						
uly	37	.....	6	18	61	$8,292.27
ugust	38	.....	3	18	59	6,990.02
ptember	37	.....	4	16	57	6,294.22
tober	33	.....	3	16	52	5,325.85
vember	33	.....	.....	14	47	4,666.32
ember	17	.....	.....	12	29	2,093.66
1907.						
anuary	16	.....	.....	10	26	2,117.10
February	15	.....	3	8	26	2,545.77
March	14	.....	2	.....	16	2,092.50
April	21	.....	3	.....	24	[a] 2,507.50
May	22	.....	3	.....	25	[a] 4,121.26
June	20	.....	3	.....	23	[a] 3,935.83
Total	.....	.....	.....	.....	.....	50,982.30

[a] Includes district judges.

TABLE 3.—*Bureau of municipalities.* [a]

1906.						
July	33	.....	.....	.....	33	$1,973.33
August	35	.....	.....	1	36	2,819.81
September	35	.....	.....	1	36	3,093.17
October	38	.....	.....	1	39	3,070.20
November	41	.....	.....	1	42	3,442.89
December	2	.....	.....	.....	2	367.50
1907.						
January	2	.....	.....	.....	2	198.33
February	.....	.....	.....	.....	.....	.....
March	.....	.....	.....	.....	.....	.....
April	.....	.....	.....	.....	.....	.....
May	.....	.....	.....	.....	.....	.....
June	.....	.....	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	14,965.23

[a] Discontinued in January.

TABLE 4.—*Division of schools.* [a]

1906.						
July	.....	.....	.....	.....	.....	.....
August	.....	.....	.....	.....	.....	.....
September	.....	.....	.....	.....	.....	.....
October	.....	.....	.....	.....	.....	.....
November	.....	.....	.....	.....	.....	.....
December	37	.....	2	1	40	$2,798.37
1907.						
January	32	.....	13	.....	45	2,558.35
February	31	.....	11	.....	42	2,477.74
March	32	.....	3	.....	35	2,423.34
April	33	.....	3	.....	36	2,466.66
May	33	.....	3	.....	36	2,513.83
June	32	.....	2	.....	34	2,445.60
Total	.....	.....	.....	.....	.....	17,683.89

[a] Separated December 1, 1906, from bureau of municipalities.

TABLE 8.—*Police department.*

Month.	Gold.		Silver.		Total employees.	Total salaries and wages.
	Monthly.	Hourly	Monthly.	Hourly		
1906.						
	227				227	$12,325.86
	241		1		242	13,067.49
	239		1		240	13,527.43
	245				245	14,629.22
	242				242	14,427.27
	262				262	10,948.00
1907.						
	171				171	10,761.26
	185				185	11,750.54
	198				198	12,485.78
	199				199	12,429.26
	188				188	12,506.29
	184				184	11,855.20
						150,713.60

TABLE 9.—*Revenue department.*

1906.						
July	53		17	4	74	$7,422.19
August	51		19	4	74	7,783.78
September	55		19	6	80	8,093.19
October	61		19	10	90	8,418.05
November	62		20	8	90	8,769.55
December	62		20		82	8,135.28
1907.						
January	59		21		80	8,350.90
February	56		21		77	8,233.76
March	55		23		78	7,448.08
April	60		25		85	7,273.00
May	64		25		89	9,883.75
June	65		25		90	8,833.65
Total						98,645.18

TABLE 10.—*Division of public works.*[a]

1906.						
July	7				7	$1,142.71
August	7	1			8	1,247.33
September	8	1			9	1,502.51
October	8		1		9	1,120.41
November	9		1		10	1,782.17
December	10		1		11	1,576.68
1907.						
January	12		1	3	16	1,750.23
February	13		1	4	18	2,063.56
March	13		1	18	32	2,280.34
April	20		35	192	247	6,200.34
May	19		19	256	294	8,074.71
June	19		19	62	100	6,847.01
Total						35,588.00

[a] Previous to December 1, 1906, office of water commissioner.

TABLE 5.—*Fire department.*

Month.	Gold.		Silver.		Total employees.	Total salaries and wages.
	Monthly.	Hourly.	Monthly.	Hourly.		
1906.						
July	2				2	$333.33
August	2		3		5	353.83
September	5		3		8	536.67
October	10		3		13	1,410.32
November	15		3		18	1,530.16
December	19			1	20	2,281.66
1907.						
January	18			1	19	2,216.23
February	18			1	19	2,053.01
March	18			1	19	2,062.34
April	16			1	17	1,886.17
May	19			1	20	2,215.16
June	21			1	22	2,712.50
Total						19,591.38

TABLE 6.—*Legal department.*

1906.						
July	3				3	$710.41
August	4				4	801.05
September	5				5	1,250.01
October	5				5	1,055.55
November	4				4	836.66
December	3				3	741.68
1907.						
January	3				3	733.33
February	3				3	1,302.77
March	3				3	733.34
April	4				4	798.33
May	5				5	999.16
June	5				5	925.00
Total						10,887.29

TABLE 7.—*Judiciary department.*

1906.						
July	9				9	$2,564.55
August	9				9	2,552.10

[redacted]

TABLE 8.—*Police department.*

Month.	Gold.		Silver.		Total employees.	Total salaries and wages.
	Monthly.	Hourly	Monthly.	Hourly		
1906.						
July	227				227	$12,325.86
August	241		1		242	13,067.49
September	239		1		240	13,527.43
October	245				245	14,629.22
November	242				242	14,427.27
December	262				262	10,948.00
1907.						
January	171				171	10,761.26
February	185				185	11,750.54
March	198				198	12,485.78
April	199				199	12,429.26
May	188				188	12,506.29
June	184				184	11,855.20
Total						150,713.60

TABLE 9.—*Revenue department.*

1906.						
July	53		17	4	74	$7,422.19
August	51		19	4	74	7,783.78
September	55		19	6	80	8,093.19
October	61		19	10	90	8,418.05
November	62		20	8	90	8,769.55
December	62		20		82	8,135.28
1907.						
January	59		21		80	8,350.90
February	56		21		77	8,233.76
March	55		23		78	7,448.08
April	60		25		85	7,273.00
May	64		25		89	9,883.75
June	65		25		90	8,833.65
Total						98,645.18

TABLE 10.—*Division of public works.*[a]

1906.						
July	7				7	$1,142.71
August	7	1			8	1,247.33
September	8	1			9	1,502.51
October	8		1		9	1,120.41
November	9		1		10	1,782.17
December	10		1		11	1,576.68
1907.						
January	12		1	3	16	1,750.23
February	13		1	4	18	2,063.56
March	13		1	18	32	2,280.34
April	20		35	192	247	6,200.34
May	19		19	256	294	8,074.71
June	19		19	62	100	6,847.01
Total						35,588.00

[a] Previous to December 1, 1906, office of water commissioner.

APPENDIX 2.—DEPARTMENTS OF REVENUES.

TABLE 11.—*List of letters and parcels registered in the post-offices of the Canal Zone from July 1, 1906, to June 30, 1907.*

Name of post-office.	Domestic letters registered.	Domestic parcels registered.	Foreign letters registered.	Foreign parcels registered.	Letters and parcels registered free.	Total.
Ancon	2,562	447	3,565	44	2,433	9,042
Ancon, Station A	1,236	153	791	25	10,009	122,214
Bas Obispo	471	121	1,179	81	1,638	3,490
Bohio	98	6	215	1	256	576
Cristobal	4,177	742	4,763	47	2,129	11,858
Culebra	2,187	582	3,282	29	2,407	8,487
Corozal	247	61	396	20	932	1,656
Empire	1,971	1,020	4,692	183	10,107	17,973
Gatun	922	169	1,672	18	1,419	4,200
Gorgona	1,271	351	4,043	28	1,230	6,923
Las Cascadas	357	201	837	54	490	1,939
La Boca	624	196	983	38	166	2,007
Matachin	118	35	314	9	263	739
Paraiso	744	105	1,081	12	1,689	3,631
Pedro Miguel	1,806	456	781	11	1,404	4,458
San Pablo	41	8	192	2	94	337
Tabernilla	307	55	510	3	523	1,398
Total	19,139	4,708	29,287	605	37,189	90,928

I hereby certify that the above statement is correct.

TOM M. COOKE, *Collector of Revenues.*

ANCON, CANAL ZONE, *July 1, 1907.*

TABLE 12.—*Detailed statement of the number of registered pieces dispatched to foreign points by the Cristobal exchange office for period July 1, 1906, to June 30, 1907.*

Month.	New York.	Jamaica.	Barbados.	Trinidad.	Colon.	French.	Total.
1906.							
July	1,892	988	1,733	.....	52	.....	4,665
August	1,631	1,193	1,382	.....	56	.....	4,262
September	1,516	766	490	65	44	.....	2,881
October	1,724	884	305	130	68	.....	3,111
November	1,810	612	436	114	92	.....	3,064
December	3,204	888	535	228	108	67	5,030
1907.							
January	2,087	521	583	345	120	71	3,727
February	2,477	737	567	278	105	134	4,298

[redacted]

TABLE 13.—*Detailed statement of mail dispatches made from July 1, 1906, to June 30, 1907.*

Month.	New York.	Jamaica.	Barbados.	Trinidad.	Port Limon.	New Orleans.	French.	Total.
1906.								
July	11	2	3	.....	.....	.....	.....	16
August	8	2	2	4	.....	.....	.....	16
September	8	3	2	2	.....	.....	.....	15
October	8	3	2	2	.....	.....	.....	15
November	10	4	4	2	.....	.....	.....	20
December	9	6	4	3	.....	2	1	25
1907.								
January	8	6	3	3	.....	3	2	25
February	9	3	2	3	.....	4	2	23
March	7	4	3	3	3	4	2	26
April	12	6	3	3	5	6	2	37
May	10	6	3	3	4	4	3	33
June	8	4	3	4	4	5	2	30
Total	108	49	34	32	16	28	14	281

I hereby certify that the above statement is correct.

TOM M. COOKE, *Director of Posts.*

ANCON, CANAL ZONE, *July 1, 1907.*

TABLE 14.—*Statement of money-order business during fiscal year ending June 30, 1907.*

Month.	Number of orders issued.	Amount of money orders issued.			Fees.
		On United States.	On Canal Zone.	Total.	
1906.					
July	2,754	$94,127.22	$4,273.83	$98,401.05	$380.26
August	4,774	121,248.90	7,003.26	128,252.16	547.46
September	4,455	111,908.34	6,206.62	118,114.96	507.36
October	5,840	140,705.34	9,571.78	150,277.12	655.41
November	5,883	141,573.61	9,805.98	151,379.59	663.32
December	6,785	163,084.03	9,685.00	172,769.03	757.52
1907.					
January	7,407	179,564.62	21,486.95	201,051.57	863.98
February	7,609	186,730.18	32,580.01	219,310.19	920.22
March	8,246	184,111.25	37,747.78	221,859.03	955.34
April	10,763	263,739.51	59,383.46	323,122.97	1,340.46
May	8,782	205,694.94	47,317.42	253,012.36	1,066.33
June	9,532	227,738.71	53,676.60	281,415.31	1,174.99
Total	82,830	2,020,226.65	298,738.69	2,318,965.34	9,832.65

Average amount of each money order, $28 plus.
Correct.

TOM M. COOKE, *Director of Posts.*

ANCON, CANAL ZONE, *July 1, 1907.*

TABLE 15.—*Sales of Panama postage stamps surcharged "Canal Zone" from July 1, 1906, to June 30, 1907.*

Month.	Value.	Month.	Value.
1906.		1907.	
July	$3,412.03	January	$3,683.58
August	2,985.23	February	4,646.87
September	3,725.87	March	6,703.45
October	3,401.14	April	5,115.70
November	4,941.64	May	6,442.54
December	4,928.10	June	4,817.64

Total value, $54,803.79.

I hereby certify that the above statement is correct.

TOM M. COOKE, *Director of Posts.*

ANCON, CANAL ZONE, *July 1, 1907.*

APPENDIX 3.—JUDICIARY DEPARTMENT.

TABLE 21.—*Statement of business transacted in court of the first judicial circuit of the Canal Zone, July 1, 1906, to June 30, 1907.*

Month.	Cases filed.	Convicted.	Acquitted.	Dismissed.	Collections.	
					Fines.	Costs.
1906.						
July	2	2				
August	8	2	2	3	$20.00	
September	2		8	3	50.00	$17.30
October	12	5	2	7	30.00	20.25
November	15	7	2	6	322.00	7.85
December	7	3		1	136.00	9.35
1907.						
January	11	6	1	5	20.00	7.60
February	9	3		4	20.00	3.20
March	9	8	1	2	57.00	14.20
April	6	4			24.00	7.30
May	10	2	2	1		
June	8	2	3	6		
Total	99	44	21	38	679.00	87.05

Civil cases:

Cases pending July 1, 1906	4
Cases filed	16
Cases settled	17
Cases pending June 30, 1907	3
Costs	$83.40
Number of sessions of court	95

TABLE 22.—*Statement of business transacted in court of second judicial circuit of the Canal Zone, July 1, 1906, to June 30, 1907.*

Month.	Cases filed.	Convicted.	Acquitted.	Dismissed.	Collections.	
					Fines.	Costs.
1906.						
July	17	10	2	4	$55.00	$16.00
August	20	16	8	2	175.65	145.35
September	18	13	1	2	295.00	38.40
October	21	10	4	9		86.90
November	13	6	2	7		
December	15	5		7	30.00	7.05
1907.						

[redacted]

TABLE 23.—*Statement of business transacted in court of third judicial circuit of the Canal Zone, July 1, 1906, to June 30, 1907.*

Month.	Cases filed.	Convicted.	Acquitted.	Dismissed.	Collections.	
					Fines.	Costs.
1906.						
July	6	5		1		
August	2		2			
September	2	3		1	$26.00	$6.70
October	4	1				
November	5	2	1	2	50.00	1.00
December	8	4			10.00	16.15
1907.						
January	4	5	2	2		
February	4	2	3			
March	3	1		1	5.00	2.80
April	9	2	1	3		
May	6	4	3	2	25.00	8.10
June	2	1	1			
Total	55	30	13	12	116.00	34.75

Civil cases:	
Cases pending July 1, 1906	8
Cases filed	25
Cases settled	23
Cases pending June 30, 1907	10
Costs	$187.25
Number of sessions of court	112

TABLE 24.—*Statement of business transacted in the supreme court of the Canal Zone, July 1, 1906, to June 30, 1907.*

Total cases heard	15
Total cases decided	15
Total costs collected	$61.55
Total sessions	17
Number of attorneys admitted	8

APPENDIX H.—CRIMINAL STATISTICS.

TABLE 25.—*Statement of arrests made by the Canal Zone police department, July 1, 1906, to June 30, 1907, inclusive.*

Charge.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.
Abusive language		6		15		22		12	19	14	11	15	136
Accessory to petit larceny									1				1
Adultery	1			1		1	2				2		7
Affray		1											1
Aiding prisoner to escape					1								1
Attempt at arson												1	1
Arson					2						1		3
Assault	8	12	16	22	18	14	11	9	17	18	19	39	203
Accessory to murder			1					1					2
Assault and battery	6	11	4	8	14	14	11	4	10	12	21	13	128
Assaulting officer		2	6	1		1							10
Assault with deadly weapon	2	1	3	5		8	2	1	9	2	3	3	39
Assault with attempt to kill	1						1				1	3	6
Attempt to rape	1									1	1		3
Breaking jail			2										2
Burglary	1	7		10	1	6	4	3	7	1	2	6	48
Broaching cargo			1		1				1				3
Contempt of court	3	2	1	2		2	8	2	4	5	1		30
Creating nuisance	4												4
Crime against nature										1			1
Criminal neglect and manslaughter				1									1
Criminal carelessness			3										3
Cruelty to animals	5	1	3		5	3	2				1	1	21
Cruelty to children	1			1					2	1		1	6
Desertion of wife										2			2
Destroying Government property										9	1		10
Desertion from Marine Corps			6			1		1		1			

APPENDIX H.—CRIMINAL STATISTICS—Continued.

TABLE 25.—*Statement of arrests made by the Canal Zone police department, July 1, 1906, to June 30, 1907, inclusive*—Continued.

Charge.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.
Disturbing the peace	31	24	16	15	10	26	25	39	34	17	18	1	256
Desertion from ship	....	....	....	....	.....	1	3	7	2	.....	.....	.....	13
Deportation	....	....	....	....	.....	.....	.....	.....	.....	1	1	2	4
Disorderly conduct	50	50	78	87	111	93	94	98	89	101	156	159	1,176
Discharging firearms in town	....	....	....	....	.....	.....	.....	.....	.....	2	.....	1	3
Extradition	....	....	....	....	.....	.....	.....	.....	.....	1	.....	.....	1
Embezzlement	2	3	1	2	2	7	4	5	3	5	3	.....	37
False representation	....	....	....	....	.....	.....	.....	.....	.....	3	.....	.....	3
Fighting	....	23	9	17	.....	20	12	28	41	27	41	11	229
Fraud	10	1	3	9	2	6	4	5	5	13	.....	2	60
False accusation	....	....	....	....	1	.....	.....	.....	.....	.....	.....	.....	1
Forgery	4	5	....	....	1	2	2	5	2	3	2	1	27
Gambling	....	4	4	....	4	.....	7	2	1	16	3	.....	41
Grand larceny	2	4	8	3	4	5	2	3	7	19	13	18	88
Indecent exposure	6	2	6	1	3	.....	3	4	....	2	5	2	34
Inciting riot	....	....	....	....	.....	.....	5	13	13	.....	.....	10	41
Insanity	6	5	5	2	.....	.....	1	5	4	3	3	2	36
Interfering with officer	....	....	....	....	.....	.....	.....	.....	7	4	.....	5	16
Intoxication and disorderly	38	69	75	97	63	67	54	65	74	64	53	68	787
Kidnapping	....	.....	1	....	.....	.....	.....	.....	.....	.....	.....	.....	1
Keeping disorderly house	....	....	....	....	.....	.....	.....	.....	.....	1	1	.....	2
Keeping firearms without license	....	3	3	2	1	2	3	3	5	9	5	2	38
Lascivious cohabitation	....	2	....	10	.....	4	6	4	2	1	4	3	36
Libel	7	....	....	....	.....	.....	.....	.....	.....	1	.....	1	9
Larceny	....	6	1	2	2	5	3	4	....	.....	.....	.....	23
Malicious mischief	5	3	1	3	2	4	13	15	9	4	6	5	70
Mutiny	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	1	1
Murder	....	....	1	....	.....	1	1	2	....	.....	.....	.....	5
Nonsupport of family	....	....	....	....	.....	.....	.....	.....	.....	.....	1	1	2
Obstructing railroad track	....	....	1	....	.....	.....	.....	.....	.....	.....	.....	.....	1
Obtaining money under false pretenses	....	....	....	....	1	.....	.....	.....	3	3	8	.....	15
Obtaining goods under false pretenses	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	2	2
Obscene and indecent language	14	.....	16	5	34	.....	.....	.....	.....	.....	.....	.....	69
Perjury	....	....	1	....	.....	.....	.....	.....	.....	.....	.....	.....	1
Petit larceny	40	24	32	29	37	28	35	39	42	50	23	33	412
Passing counterfeit money	....	....	1	....	.....	.....	.....	.....	.....	.....	.....	.....	1
Receiving stolen goods	3	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	3
Rape	....	....	....	....	1	.....	.....	.....	1	3	.....	.....	5
Resisting officer	3	4	5	4	2	8	11	8	67	1	2	1	116
Robbery	....	1	....	....	.....	.....	2	.....	.....	1	.....	2	6
Seduction	....	....	....	1	.....	.....	.....	1	2	1	1	.....	6
Sodomy	....	....	....	....	3	.....	.....	.....	.....	.....	2	.....	5
Selling adulterated liquors	....	....	....	....	1	.....	.....	.....	.....	.....	.....	.....	1
Suspicion	4	....	....	....	2	7	6	5	6	4	5	3	42
Slander	....	1	2	5	.....	1	.....	2	1	.....	.....	.....	12
Selling without license	3	3	3	4	8	5	8	9	2	3	8	8	64
Threats	....	2	5	1	2	4	.....	6	7	6	2	2	37
Trespassing	19	102	92	38	51	24	64	10	24	23	7	15	469
Violation of internal revenue law	....	....	....	....	.....	.....	.....	1	.....	.....	.....	.....	1
Violation of quarantine regulations	....	....	....	....	.....	.....	3	.....	.....	.....	.....	.....	3
Violation of emigration law	....	....	....	....	.....	1	.....	.....	.....	.....	.....	.....	1
Violation of school ordinance	....	....	....	....	8	.....	.....	.....	.....	.....	.....	.....	8
Violation of liquor law	....	....	1	....	1	.....	.....	.....	.....	.....	.....	.....	2
Violation of sanitary regulations	56	71	95	60	75	103	62	68	93	62	89	91	925
Violation of district ordinance	....	....	....	1	4	8	4	....	18	1	3	4	43
Violation of custom regulations	....	....	....	....	2	.....	.....	.....	.....	.....	.....	.....	2
Vagrancy	69	37	26	23	24	6	20	18	19	8	6	7	263
Total	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	6,236

TABLE 26.—*Statement of all convictions of arrests made by the Canal Zone police department, July 1, 1906, to June 30, 1907, inclusive.*

1906.		1907.	
July	326	January	409
August	405	February	430
September	452	March	581
October	414	April	455
November	413	May	463
December	413	June	432

Total, 5,193.

TABLE 27.—*Statement showing number of convicts in penitentiary during year ended June 30, 1907.*

Convicts in confinement July 1, 1906	45	Number of convicts discharged, pardoned etc., during year ended June 30, 1907	48
Number of convicts beginning penitentiary sentences during the year ended June 30, 1907	85	Number of convicts in confinement June 30, 1907	82
	130		130

TABLE 28.—*Statement of crimes committed by prisoners confined in the Canal Zone penitentiary, June 30, 1907.*

Arson	2	Obstructing railroad track	1
Attempt to murder	3	Manslaughter	2
Burglary	18	Murder	1
Crime against nature	1	Rape	3
Embezzlement	1	Sodomy	1
Forgery	15	Rioting	3
Grand larceny	23		
Larceny	8	Total	82

TABLE 29.—*Statement of occupation of prisoners confined in the Canal Zone penitentiary, June 30, 1907.*

Blacksmith	1	Messenger	1
Brakeman	2	Molder	1
Carpenter	5	No occupation	2
Clerk	1	Oiler	1
Cook	1	Porter	1
Farmer	1	Sailor	5
Fireman	2	Switchman	1
Foreman	1	Vendor	1
Laborer	48	Watchman	1
Laundress	2		
Machinist	4	Total	82

TABLE 30.—*Educational qualifications of prisoners confined in the Canal Zone penitentiary, June 30, 1907.*

Able to read and write	52
Unable to read and write	30
Total	82

TABLE 31.—*Statement showing nationality of prisoners confined in the Canal Zone penitentiary, June 30, 1907.*

American	8	Jamaican	14
Antiguan	7	Nicaraguan	1
Barbadian	17	Panamanian	6
Chilean	4	Peruvian	4
Colombian	8	Porto Rican	1
Danish	1	Spanish	3
Ecuadorian	1	St. Lucian	1
East Indian	1		
German	1	Total	82
Italian	1		

TABLE 32.—*Statement showing ages of Zone prisoners confined in the Canal Zone penitentiary, June 30, 1907.*

Under 15 years	1
15 to 30 years	63
30 to 40 years	13
40 to 50 years	4
70 to 80 years	1
Total	82
Age of youngest prisoner	13
Age of oldest prisoner	77

TABLE 16.—*Detailed statement of th[illegible] prisoners [illegible] 30, 1907.*

	[illegible] rolls [illegible] guards, cost of subsisting and clothing prisoners.	Value of work performed by prisoners.
July	$1,056.25	$310.80
August	1,221.20	379.40
September	1,176.35	710.80
October	1,221.55	853.40
November	1,478.79	680.40
December	1,307.41	777.60
Jan	1,320.00	949.20
Fe	1,412.93	846.80
M	1,675.41	962.40
	1,281.58	1,103.20
	1,723.64	907.20
	1,574.35	957.60
	16,449.46	9,438.80

APPENDIX 5.—DIVISION OF PUBLIC WORKS.

Consumption of water and collection of water rents in the city of Panama for the fiscal year ending June 30, 1907.

[Estimated population of the city of Panama, 30,000; estimated number of connections to supply entire city, 1,400.]

	Number of consumers	Consumption for quarter.	

APPENDIX 6.—FIRE DEPARTMENT.

BLE 35.—*Statement of fires in the Canal Zone and the amount of loss resulting, from October 1, 1906, to June 30, 1907.*

Month.	Number of fires.	Total loss.	Government loss.
1906.			
	0		
	0		
	4	$110	$110
1907.			
	3	24	12
	1	5	5
	5	110	110
	4	c 110,000	c 110,000
	8	225	195
	4	10	10

Fire in Panama, not included in above, resulted in loss of $4,750 on building and contents.
Two fires in Colon, not included above, resulted in loss of $10,000, none of which was Government perty.
Fire on April 1 destroyed two-thirds of Mount Hope storehouse.

TABLE 33.—*Statement showing cost of subsisting, clothing, and guarding Zone prisoners and value of work performed by prisoners during the fiscal year ended June 30, 1907.*

Month.	Pay rolls for guards, cost of subsisting and clothing prisoners.	Value of work performed by prisoners.
1906.		
July	$1,056.25	$310.80
August	1,221.20	379.40
September	1,176.35	710.80
October	1,221.55	853.40
November	1,478.79	680.40
December	1,307.41	777.60
1907.		
January	1,320.00	949.20
February	1,412.93	846.80
March	1,675.41	962.40
April	1,281.58	1,103.20
May	1,723.64	907.20
June	1,574.35	957.60
Total	16,449.46	9,438.80

Debit balance, $7,010.66.

APPENDIX 5.—DIVISION OF PUBLIC WORKS.

TABLE 34.—*Consumption of water and collection of water rents in the city of Panama for the fiscal year ending June 30, 1907.*

[Estimated population of the city of Panama, 30,000; estimated number of connections to supply entire city, 1,400.]

Quarter ending—	Number of consumers paying water rents.	Consumption for quarter.		
		Private.	Public and hydrants.	Total.
		Gallons.	*Gallons.*	*Gallons.*
June 30, 1906	432	.....	.....	.....
September 30, 1906	633	.....	.....	.....
December 31, 1906	753	12,934,110	1,674,990	14,609,000
March 31, 1907	892	51,793,147	8,900,853	60,694,000
June 30, 1907	997	46,946,797	19,332,203	66,279,000
Total	.....	111,674,054	29,908,046	141,582,000

APPENDIX 6.—FIRE DEPARTMENT.

TABLE 35.—*Statement of fires in the Canal Zone and the amount of loss resulting, from October 1, 1906, to June 30, 1907.*

Month.	Number of fires.	Total loss.	Government loss.
1906.			
October	0		
November	0		
December	4	$110	$110
1907.			
January	3	24	12
February	1	5	5
March [a]	5	110	110
April [b]	4	[c] 110,000	[c] 110,000
May	8	225	195
June	4	10	10

[a] Fire in Panama, not included in above, resulted in loss of $4,750 on building and contents.
[b] Two fires in Colon, not included above, resulted in loss of $10,000, none of which was Government property.
[c] Fire on April 1 destroyed two-thirds of Mount Hope storehouse.

APPENDIX 7.—MUNICIPALITIES.

nditures of the different municipalities of the Canal Zone from July 1, 1906, to April 14, 1907, inclusive.

[All amounts in Panama silver.]

RECEIPTS.

	Justice.	Real-estate tax.	Liquor licenses.	Slaughter tax.	Rentals.	Other taxes.	Over-payments.	Total receipts.
	$2,560.50	$3,145.64	$37,432.00	$1,169.50	$2,047.15	$5,446.84	.....	$51,801.63
	2,649.96	1,331.60	4,283.40	2,166.00	656.93	5,540.70	.....	16,628.59
	3,326.70	605.12	1,600.00	2,520.00	593.50	5,266.12	.....	13,911.44
	3,744.00	44.00	1,800.00	2,755.00	1,567.94	4,441.10	.....	14,352.04
	3,928.90	31.25	200.00	2,352.00	1,940.15	4,260.80	.....	12,713.10
	3,889.40	4.40	15,600.00	3,196.00	1,668.70	4,318.00	.....	28,676.50
	3,386.70	.....	34,800.00	3,870.80	1,521.05	5,586.93	.....	49,165.48
	4,305.30	27.50	.....	3,687.90	983.28	5,737.90	.....	14,741.88
	5,385.70	.....	.....	3,612.60	2,147.70	7,316.05	.....	18,462.05
	2,384.00	183.00	.....	2,009.70	676.50	5,248.18	$0.18	10,501.56
	35,561.16	5,372.51	95,715.40	27,339.50	13,802.90	53,162.62	.18	230,954.27

EXPENDITURES.

Roads.	Public lights.	Schools.	Indigent.	Office furniture and supplies.	Justice.	Ferry-boat.	Total expenditures.	Cash balance, end of month.
								$109,617.38
$2,501.70	$406.40	$233.60	$1.00	$780.48	$1,757.31	$25.00	$17,482.18	143,936.83
246.20	103.40	1,548.24	84.60	383.48	1,662.86	25.00	12,239.97	148,325.45
986.44	571.76	1,159.92	215.40	398.94	1,304.04	107.50	16,531.50	145,705.39
1,062.89	347.24	729.46	257.70	264.14	1,505.69	.....	9,458.58	a 150,598.85
1,465.70	422.20	955.68	69.60	25.10	1,834.67	51.40	10,967.05	152,344.90
250.82	455.72	472.08	169.20	83.22	1,489.56	20.00	10,868.42	170,152.98

1907.											
January	6,245.65	5,793.85	1,521.10	273.80	3,917.24	99.30	1,316.98	1,610.02	.....	20,777.94	198,540.52
February	2,201.96	2,730.12	9,050.79	438.68	1,414.83	163.50	182.38	1,703.56	70.00	17,955.82	195,326.58
March	2,491.63	818.66	24,695.43	491.76	2,357.44	35.40	1,663.38	2,425.60	52.00	35,031.30	178,757.33
April 1–14	2,385.66	1,556.12	15,473.03	349.44	18.50	67.80	505.54	1,356.96	86.32	21,799.37	167,459.52
Total	42,554.75	32,781.26	57,254.10	3,860.40	12,806.99	1,163.50	5,603.64	16,650.27	437.22	173,112.13	.....

a In comparative statement published in the last annual report this balance was erroneously given as $150,598.49 instead of $150,598.85.

On April 15, 1907, under the provision of the Executive order of the President of March 13, 1907, the municipalities of the Canal Zone were abolished and four administrative districts created. On this date $167,459.52 Panama silver was deposited with the treasurer of the Canal Zone to the credit of the administrative districts.

APPENDIX 7.—MUNICIPALITIES.

nditures of the different municipalities of the Canal Zone from July 1, 1906, to April 14, 1907, inclusive.

[All amounts in Panama silver.]

RECEIPTS.

	Justice.	Real-estate tax.	Liquor licenses.	Slaughter tax.	Rentals.	Other taxes.	Over-payments.	Total receipts.
.....	$2,560.50	$3,145.64	$37,432.00	$1,169.50	$2,047.15	$5,446.84	.....	$51,801.63
.....	2,649.96	1,331.60	4,283.40	2,166.00	656.93	5,540.70	.....	16,628.59
.....	3,326.70	605.12	1,600.00	2,520.00	593.50	5,266.12	.....	13,911.44
.....	3,744.00	44.00	1,800.00	2,755.00	1,567.94	4,441.10	.....	14,352.04
.....	3,928.90	31.25	200.00	2,352.00	1,940.15	4,260.80	.....	12,713.10
.....	3,889.40	4.40	15,600.00	3,196.00	1,668.70	4,318.00	.....	28,676.50
.....	3,386.70	.....	34,800.00	3,870.80	1,521.05	5,586.93	.....	49,165.48
.....	4,305.30	27.50	.....	3,687.90	983.28	5,737.90	.....	14,741.88
.....	5,385.70	.....	.....	3,612.60	2,147.70	7,316.05	.....	18,462.05
.....	2,384.00	183.00	.....	2,009.70	676.50	5,248.18	$0.18	10,501.56
.....	35,561.16	5,372.51	95,715.40	27,339.50	13,802.90	53,162.62	.18	230,954.27

EXPENDITURES.

Roads.	Public lights.	Schools.	Indigent.	Office furniture and supplies.	Justice.	Ferry-boat.	Total expenditures.	Cash balance, end of month.
.....	.....	.....	.....	.....	.....	.....	.....	$109,617.38
$2,501.70	$406.40	$233.60	$1.00	$780.48	$1,757.31	$25.00	$17,482.18	143,936.83
246.20	103.40	1,548.24	84.60	383.48	1,662.86	25.00	12,239.97	148,325.45
986.44	571.76	1,159.92	215.40	398.94	1,304.04	107.50	16,531.50	145,705.39
1,062.89	347.24	729.46	257.70	264.14	1,505.69	.....	9,458.58	a 150,598.85
1,465.70	422.20	955.68	69.60	25.10	1,834.67	51.40	10,967.05	152,344.90
250.82	455.72	472.08	109.20	83.22	1,489.56	20.00	10,868.42	170,152.98

1907.											
January	6,245.65	5,793.85	1,521.10	273.80	3,917.24	99.30	1,316.98	1,610.02	.....	20,777.94	198,540.52
February	2,201.96	2,730.12	9,060.79	438.68	1,414.83	163.50	182.38	1,703.56	70.00	17,865.82	195,326.88
March	2,491.63	818.66	24,695.43	491.76	2,357.44	35.40	1,663.33	2,425.60	52.00	35,031.30	178,757.33
April 1–14	2,395.66	1,556.12	15,473.03	349.44	18.50	67.80	505.54	1,356.96	88.32	21,790.37	167,459.52
Total	42,554.75	32,781.26	57,254.10	3,860.40	12,806.99	1,163.50	5,003.64	16,660.27	437.22	173,112.13	.....

a In comparative statement published in the last annual report this balance was erroneously given as $150,598.49 instead of $150,598.85.
On April 15, 1907, under the provision of the Executive order of the President of March 13, 1907, the municipalities of the Canal Zone were abolished and four administrative districts created. On this date $167,459.52 Panama silver was deposited with the treasurer of the Canal Zone to the credit of the administrative districts.

96, to April 14, 1907, inclusive.

	Total receipts.
[illegible]	[illegible]

APPENDIX H.

REPORT OF THE CHIEF SANITARY OFFICER.

ANCON, CANAL ZONE, *August 23, 1907.*

SIR: During the fiscal year 1906–7 the health conditions of the Isthmus have been good. This can be best exemplified by calling your attention to a few statistics concerning our force.

During the preceding calendar year we averaged a force of 26,000 men; during the fiscal year, 32,000; the death rate for the two periods was, respectively, 41 per thousand and 39 per thousand, a marked improvement. I compare the calendar and fiscal years, as heretofore we have gotten together no report for the fiscal year.

The number of white employees, respectively, were 5,464 against 7,727, the annual death rates for these whites being 16.27 and 15.93, respectively, per thousand. Our negro employees averaged, respectively, 21,822 and 25,360, the death rate being 49.01 and 45.34. The total population of the Canal Zone, including Panama and Colon, averaged 66,011 and 87,215; the death rate 49.10 and 42.08.

These figures show a marked improvement in the death rate among all classes. The lowest difference existed among the whites. This was to have been expected, as the death rate among the whites was small during the previous year.

During the fiscal year great improvements have been made in housing and feeding the force. Men of the lower grade of laborers, the 20-cent men, are now required to take their meals at kitchens managed by the Commission; this gives them a wholesome and an abundant diet.

[redacted]

You will notice that, as in all former years, the death rate of the negro employees is very much higher than that of whites, this year being as 3 to 1. It is apparent that the white man stands the conditions on the Isthmus just about three times as well as the negro; but the death rate among our negro employees is decreasing year by year, and I hope will eventually be the same as that of the whites.

Pneumonia, which for the past two years has been the greatest cause of death among our negro employees, is markedly decreasing. In July, 1906, the first month of the fiscal year, we had 86 deaths from pneumonia among our employees. The mortality from this disease has been steadily decreasing, until in June, 1907, the last month of the fiscal year, we had only 20 deaths.

The general work of the sanitary department has increased and expanded during the year as was made necessary by the general expansion of work on the canal. That the work of the department has been done efficiently is evidenced by the fact that though the area and population to be cared for have been greatly increased, still the general health conditions have steadily improved.

Very respectfully, yours,

W. C. GORGAS,
Chief Sanitary Officer.

CHAIRMAN ISTHMIAN CANAL COMMISSION,
Culebra, Canal Zone.

GENERAL STATISTICS.

Population, number of gold and silver employees separately and consolidated, deaths, and death rates, by months, for the fiscal year ending June 30, 1907.

JULY 1906.

	Population.	Deaths.[a]	Annual average per 1,000.
Employees of Canal Commission and Panama R. R. Co.:			
Gold	5,052	13	30.87
Silver	22,989	138	72.03
Total	28,041	151	64.71
Employees and civil population:			
Panama	26,199	111	50.84
Colon and Cristobal	13,578	88	77.77
Canal Zone	35,000	223	76.46
Total	74,777	422	67.76

AUGUST, 1906.

Employees of Canal Commission and Panama R. R. Co.:			
Gold	5,269	8	18.22
Silver	24,286	145	71.60
Total	29,555	153	62.12
Employees and civil population:			
Panama	26,400	122	55.45
Colon and Cristobal	14,078	70	60.00
Canal Zone	35,500	214	72.33
Total	75,978	406	64.12

[a] Those credited to the Canal Zone include employees who died within the territorial limits of the Zone.

Population, number of gold and silver employees separately and consolidated, deaths, and death rates, by months, for the fiscal year ending June 30, 1907—Continued.

SEPTEMBER, 1906.

	Population.	Deaths.a	Annual average per 1,000.
Employees of Canal Commission and Panama R. R. Co.:			
Gold	5,603	7	15.00
Silver	22,661	128	67.81
Total	28,264	135	57.34
Employees and civil population:			
Panama	26,500	100	45.28
Colon and Cristobal	14,379	70	58.33
Canal Zone	36,079	180	60.00
Total	76,959	350	54.54

OCTOBER, 1906.

Employees of Canal Commission and Panama R. R. Co.:			
Gold	5,520	7	15.27
Silver	19,925	92	55.20
Total	25,445	99	46.68
Employees and civil population:			
Panama	26,700	98	44.04
Colon and Cristobal	14,710	76	62.04
Canal Zone	36,680	128	41.85
Total	78,090	302	46.40

NOVEMBER, 1906.

Employees of Canal Commission and Panama R. R. Co.:			
Gold	5,640	5	10.64
Silver	20,232	61	36.18
Total	25,872	66	30.61
Employees and civil population:			
Panama	27,654	86	37.32
Colon and Cristobal	15,236	77	60.64
Canal Zone	37,991	78	24.64
Total	80,881	241	35.76

Population, number of gold and silver employees separately and consolidated, deaths, and death rates, by months, for the fiscal year ending June 30, 1907—Continued.

JANUARY, 1907.

	Population.	Deaths.[a]	Annual average per 1,000.
Employees of Canal Commission and Panama R. R. Co.:			
White	8,303	9	13.01
Black	23,548	59	30.06
Total	31,851	68	25.62
Employees and civil population:			
Panama	30,489	105	41.33
Colon	13,596	53	46.78
Canal Zone	45,089	103	27.41

FEBRUARY, 1907.

Employees of Canal Commission and Panama R. R. Co.:			
White	8,504	10	14.11
Black	27,800	83	35.83
Total	36,304	93	30.74
Employees and civil population:			
Panama	31,063	82	31.68
Colon	13,852	51	44.18
Canal Zone	47,579	145	36.57

MARCH, 1907.

Employees of Canal Commission and Panama R. R. Co.:			
White	[b] 9,173	12	15.69
Black	[b] 27,214	110	48.50
Total	[b] 36,387	122	40.23
Employees and civil population:			
Panama	31,569	62	23.56
Colon	14,078	38	32.39
Canal Zone	49,774	157	37.85

APRIL, 1907.

Employees of Canal Commission and Panama R. R. Co.:			
White	[b] 10,170	9	10.61
Black	[b] 27,995	114	48.86
Total	[b] 38,165	123	38.67
Employees and civil population:			
Panama	31,983	81	30.39
Colon	14,263	53	44.50
Canal Zone	51,569	200	46.53

MAY, 1907.

Employees of Canal Commission and Panama R. R. Co.:			
White	[b] 10,466	16	18.34
Black	[b] 28,537	82	34.48
Total	[b] 39,003	98	30.15
Employees and civil population:			
Panama	33,584	75	26.79
Colon	14,378	41	34.21
Canal Zone	51,968	147	33.98

[a] Those credited to the Canal Zone include employees who died within the territorial limits of the Zone.

[b] Compiled from pay rolls of the previous month.

Population, number of gold and silver employees separately and consolidated, deaths, and death rates, by months, for the fiscal year ending June 30, 1907—Continued.

JUNE, 1907.

	Population.	Deaths.[a]	Annual average per 1,000.
Employees of Canal Commission and Panama R. R. Co.:			
White	[b] 10,828	19	21.05
Black	[b] 28,831	72	29.96
Total	[b] 39,659	91	27.53
Employees and civil population:			
Panama	33,854	104	36.86
Colon	14,495	41	33.94
Canal Zone	53,148	138	31.15

[a] Those credited to the Canal Zone include employees who died within the territorial limits of the Zone.

[b] Compiled from pay rolls of the previous month.

Average number of employees, per month, for the year	32,324
Average number of deaths, per month, for the year	106
Annual death rate per thousand	39.41
Average number of gold employees, per month, for the year	7,727
Average number of deaths, per month, for the year	10
Annual death rate, per thousand, of gold employees	15.93
Average number of silver employees, per month, for the year	24,587
Average number of deaths, per month, for the year	96
Annual death rate, per thousand, of silver employees	45.94
Average population, per month, for the year (Panama, Colon, and Canal Zone)	87,215
Average number of deaths, per month, for the year	306
Annual death rate, per thousand (Panama, Colon, and Canal Zone)	42.08

Deaths, by color.

White:	
Male	411
Female	134
Black:	
Male	2,290
Female	745
Chinese:	
Male	66
Female	5
Color not known:	
Male	4
Female	2
Not stated	13
Total	3,670

Deaths, by nationalities.

Deaths by ages.

Under 1 year	429	From 60 to 70 years	117
From 1 to 4 years	117	From 70 to 80 years	51
From 4 to 10 years	54	From 80 to 90 years	20
From 10 to 20 years	272	From 90 to 100 years	5
From 20 to 30 years	1,041	Over 100 years	2
From 30 to 40 years	621	Ages unknown	209
From 40 to 50 years	463		
From 50 to 60 years	269	Total	3,670

Deaths of Isthmian Canal Commission and Panama Railroad employees, by nationality.

Antigua	33	Italy	8
Austria	1	Jamaica	265
Barbados	518	Martinique	92
Bolivia	1	Mexico	1
British Guiana	2	Montserrat	10
Canada	1	Nicaragua	2
Colombia	32	Panama	46
Costa Rica	1	Porto Rico	2
Cuba	2	San Salvador	1
Demerara	5	Scotland	1
Dominica	3	Spain	39
England	9	St. Kitts	8
France	15	St. Lucia	24
Fortune Islands	5	St. Thomas	4
Greece	8	St. Vincent	6
Germany	2	Trinidad	22
Grenada	17	Unknown	15
Guadeloupe	16	United States	41
Haiti	3	Venezuela	2
Holland	2	West Indies	6
India	1		
Ireland	1	Total	1,273

Causes of death of employees of Commission and Panama Railroad Company.

Abscess, hepatic	1	Ill-defined diseases	2
Accidental traumatism	104	Intestinal obstructions	4
Alcoholism, acute	3	Liver, abscess of	5
Anæmia	1	Liver, cirrhosis of	5
Ankylostomiasis	2	Lungs, congestion of	1
Apoplexy	2	Lungs, œdema of	1
Arthritis, chronic	2	Lungs, tuberculosis of	58
Beriberi	2	Meningitis	21
Biliary calculi	2	Meningitis, purulent	1
Broncho-pneumonia	13	Myocarditis	3
Bronchitis, acute	1	Nephritis, acute	36
Bright's disease	22	Œdema of the larynx	2
Burns	2	Paralysis	2
Cellulitis	1	Pericarditis	6
Diabetes	1	Peritonitis	16
Disease of nasal fossæ	1	Pleurisy	1
Drowning, accidental	2	Pneumonia	466
Drowning, suicidal	1	Pyæmia	5
Dysentery	56	Rheumatism	2
Dysentery, amœbic	2	Senile debility	2
Endocarditis	4	Septicæmia	27
Entero-colitis	3	Skull, fracture of	1
Epilepsy	1	Stomach, cancer of	1
Epithelioma of tongue	1	Stomach, carcinoma of	1
Fever, hæmoglobinuric	6	Suicide	1
Fever, malarial	205	Syncope	1
Fever, typhoid	95	Syphilis	1
Fractures	9	Tetanus	2
Gangrene	1	Thrombosis	1
Gonorrhea	1	Tuberculosis, pulmonary	6
Heart disease	116	Tuberculosis, miliary	1
Heart, organic disease of	7	Uncinari	1
Hepatitis, acute	1	Lungs, gangrene of	3
Hemorrhage	3	Not stated	6
Hemorrhage, cerebral	2		
Empyema	5	Total	1,273
Hernia, strangulated	1		

List of deaths of white employees on the Isthmus, giving name, country, occupation, length of time on the Isthmus, age, and cause of death.

JULY, 1906.

Name.	Country.	Occupation, etc.	Time on Isthmus.	Age.	Cause of death.
Dunn, R. T	United States.	Engineer, Panama R. R.	(?)	(?)	Drowning.
Lawrence, Fred	England	Machinist	2 yrs	48	Lobar pneumonia.
Morgan, David A	United States.	Engineer department.	(?)	45	Alcoholism and malarial fever.
Poinboeuf, C. A	France	Engineering and construction.	8 mos	41	Acute peritonitis.
Ramsey, J. P	Barbados	do	1 yr	24	Hæmoglobinuric fever.
Salerno, Gamelo	Italy	Sanitary department.	6 mos	21	Lobar pneumonia.
Small, Henry	Jamaica	(?)	(?)	32	Organic disease, heart.
Smith, Elmer C	United States.	Assistant engineer	25 mos	36	Malarial fever.
Smith, H. E	do	Panama R. R.	(?)	(?)	Drowning (Panama R. R.) accident.

AUGUST, 1906.

Calender, George	France	Engineer department.	23 mos	43	Pneumonia.
Frye, Charles	United States.	Mining department	4 mos	34	Burns.
Fontenal, Edward	Spain	Engineer department.	6 mos	38	Dysentery.
Knaust, Franz	Germany	Machinist	(?)	28	Burns.
Nelson, Gilbert B	United States.	Panama R. R. (steam shovel).	(?)	52	Myocarditis, chronic.
Retty, Alfonse	France	Building construction.	(?)	(?)	Cerebral hemorrhage.
Scott, Robert F	United States.	General traction foreman.	8 mos	47	Railroad accident.
Sevarry, Miguel	Spain	Engineer department.	7 mos	38	Dysentery.

SEPTEMBER, 1906.

Currie, Eben	United States.	Engineer, Panama R. R.	27 days	(?)	Railroad accident.
Faherty, Thomas	do	do	(?)	49	Do.
Gale, Milword	Jamaica	Building construction.	8 mos	56	Pneumonia.
Milliery, J. F	Holland	Track foreman	15 mos	32	Railroad accident.
Nash, William	United States.	Engineer, Panama R. R.	27 days	(?)	Do.
Scrutis, Eftimo	Greece	Engineer department.	8 mos	33	Pneumonia.
Walker, George L	United States.	Engineer, Panama R. R.	4 mos	(?)	Railroad accident.

OCTOBER, 1906.

List of deaths of white employees on the Isthmus, giving name, country, occupation, length of time on the Isthmus, age, and cause of death—Continued.

DECEMBER, 1906.

Name.	Country.	Occupation, etc.	Time on Isthmus.	Age.	Cause of death.
Antonis, Antonio	Spain	Laborer	4 wks	29	Pneumonia.
Boojer, Ollier	Austria	do	(?)	30	Typhoid fever.
Castillo, Benjamin	Panama	do	Native.	(?)	Meningitis.
Dodd, W. R.	United States.	Engineer department.	29 mos.	38	Cardiac thrombosis.
Firth, Arthur	England	Mechanical department.	26 mos.	(?)	Fracture.
Giacimo, Fantoni	Italy	Laborer	1 mo.	24	Fracture of skull.
Savesta, Lozeno	do	do	15 days.	45	Malaria.
Weber, Leon	France	do	(?)	(?)	Fever.

JANUARY, 1907.

Casanoves, Antonio	Spain	Laborer	(?)	25	Drowning.
Estaban, Monelic	do	do	2 mos.	26	Nephritis, chronic.
Fitch, Thomas	United States.	Panama R. R.	18 mos.	35	Dysentery, amœbic.
Gonzales, Antonio	Spain	Engineering and construction.	8 mos.	24	Pneumonia.
Garcia, Leandro	do	Laborer	5 wks.	40	Do.
Marion, Dennis	United States.	Machinist	(?)	40	Intestinal obstruction.
Pruden, H. D.	do	Electrician	3 wks.	29	Tyhoid fever.
Ridley, Geo. V	do	Doctor	20 mos.	30	Pneumonia, lobar.
Wardell, Otis	do	Carpenter	3 mos.	24	Typhoid fever.

FEBRUARY, 1907.

Horne, W. R.	United States.	Carpenter	9 mos.	29	Hæmoglobinuric fever.
Newman, Frank	do	do	6 mos.	41	Tuberculosis.

MARCH, 1907.

Feeney, Michael	United States.	Panama R. R.	8 mos.	(?)	Accidental traumatism (Panama R. R.).
Fountain, John H	do	Conductor	3 yrs.	29	Do.
James, Edward	do	Clerk	22 mos.	40	Septicæmia.
Kendal, Thomas	do	Engineer department.	4 yrs.	62	Malarial fever.

APRIL, 1907.

Ferandez, Jose	Spain	Laborer	3 mos.	21	Drowning.
Martinez, Amedel	Martinique	Quinine dispenser	12 mos.	26	Pneumonia.
Morena, Amorena	Spain	Laborer	2 mos.	22	Fever, typhoid.
Pon Yela, Juan	do	do	(?)	44	Accidental traumatism.
Powell, Horatio	England	Foreman	1 yr.	33	Dysentery.
Turner, Frank M	do	Engineer department.	15 mos.	50	Cirrhosis of liver.
King, S. I	United States.	Panama R. R.	7 mos.	(?)	Septicæmia.
Murphy, Joseph	do	Machinist	1 yr.	37	Blackwater fever.
Rick, August J	do	Foreman	1 yr.	46	Septicæmia.
Little, Katherine L	do		8 mos.	13	Railroad accident (internal hemorrhage).

MAY, 1907.

Apostal, Demetris	Greece	Laborer	(?)	33	Drowning.
Barzal, Leon	Spain	do	(?)	(?)	Powder blast.
Brava, Peitro	Italy	do	(?)	58	Drowning.
Delendos, Josef	Greece	do	(?)	23	Do.
Evanglius, Georgius	do	do	15 days.	40	Pneumonia.
Fukla, Aristido	do	do		27	Drowning.
Gill, Gregoric	Spain	do	4 mos.	32	Dynamite explosion.
Guelba, Angel M	Colombia	do	1 yr.	38	Meningitis.
Lithdakis, Costis	Greece	do	(?)	22	Drowning.
Pocernama, Abundo	Spain	do	5 mos.	29	Accidental traumatism.
Sanchez, Manuel	Colombia	do	20 yrs.	20	Malaria.
William, Joseph	England	Cook	15 mos.	34	Fever, typhoid.

List of deaths of white employees on the Isthmus, giving name, country, occupation, length of time on the Isthmus, age, and cause of death—Continued.

MAY, 1907—Continued.

Name.	Country.	Occupation, etc.	Time on Isthmus.	Age.	Cause of death.
Zepatos, Mikel	Greece	Laborer	(?)	38	Drowning.
Gibson, Charles	United States.	Excavating department.	3 wks.	(?)	Dynamite explosion.
Hulme, R. A	do	Municipal Engineer department.		50	Multiple fractures (Panama R. R.).
Parke, Lyman M	do	Watchman		34	Accidental traumatism (Panama R. R.).
Warren (infant)	do		7 days	(?)	Marasmus.

JUNE, 1907.

Barcalas, Gavino	Spain	Laborer	(?)	(?)	Dynamite explosion.
Crespo, Felix	do	do			Do.
Campo, del Pedro	do	do	6 mos	42	Malarial fever.
Delining, Chas. R	Jamaica	Excavating department.	8 mos	54	Accidental traumatism (railroad).
Desemos, Francisco	Spain	Laborer	3 mos	34	Dynamite explosion.
Ferrera, Louis	do	do	4 mos	32	Carcinoma of stomach.
Fernandez, Juan	do	do	(?)	28	Dynamite explosion.
Karambiles, Nicolas	Greece	do	2 mos	33	Accidental traumatism (falling of tree).
Liz, Bantista	Spain	do		22	Dynamite explosion.
Lousta, Paul	France	do	1 wk	41	Lobar pneumonia.
Martin, Juan	Spain	do	4 mos	36	Malaria.
Robert, Jose de	do	do	2 yrs	66	Unknown.
Salvatorre, Donedu	Italy	do		27	Dynamite explosion.
Sidera, Pedro Cerarols	Spain	do		24	Do.
Welco, Atancio	do	do	4 mos	23	Accidental traumatism.
Dempsey, Patrick J	United States.	Powder man	6 wks	26	Dynamite explosion.
Loftis, J. J	do	Supervisor	2 yrs	38	Acute alcoholism.
Maher, Edward H	do	Transportation department.	3 yrs	(?)	Suffocation, accidental traumatism.
Titus, George	do	Foreman	11 mos	38	Acute alcoholism.

Causes of death.

[Panama, Colon, Canal Zone, including employees of the Isthmian Canal Commission and the Panama Railroad Company for the fiscal year 1906-7.]

Causes of death—Continued.

Classification.	Ancon Hospital.	Colon Hospital.	Line Hospital.	Panama.	Colon.	Zone.	Total.
I.—*General diseases*—Continued.							
Syphilis	1	2	1	1	.....	1	6
Gonorrhea (5 years and over)	1	.....	.....	.....	.....	.....	1
Cancer and other malignant tumors of the buccal cavity	1	.....	.....	.....	.....	.....	1
Cancer and other malignant tumors of stomach and liver	2	.....	.....	1	.....	.....	3
Cancer and other malignant tumors of peritoneum, intestines, and rectum	.....	.....	.....	.....	.....	1	1
Cancer and other malignant tumors of female genital organs	.....	2	.....	.....	1	.....	3
Cancer and other malignant tumors of the breast	.....	.....	.....	1	.....	.....	1
Cancer and other malignant tumors of other organs or of organs not specified	.....	1	.....	1	.....	.....	2
Other tumors (tumors of the female genital organs excepted)	.....	.....	.....	1	.....	1	2
Acute articular rheumatism	.....	.....	.....	2	.....	2	4
Chronic rheumatism and gout	.....	.....	.....	.....	.....	2	2
Diabetes	1	.....	1	2	.....	.....	4
Anæmia chlorisis	1	1	.....	7	.....	2	11
Other general diseases	2	.....	.....	2	.....	.....	4
Acute chronic rheumatism	.....	.....	1	.....	1	4	6
Other chronic poisoning	.....	2	.....	2	.....	1	5
II.—*Diseases of the nervous system and the organs of special sense.*							
Encephalitis	.....	.....	1	.....	.....	.....	1
Simple meningitis	7	1	4	19	2	3	36
Epidemic cerebro-spinal meningitis	5	.....	.....	1	.....	1	7
Pneumococcus meningitis	3	5	.....	1	.....	1	10
Congestion and hemorrhage of the brain	2	2	8	14	7	5	38
Softening of the brain	1	.....	.....	.....	.....	.....	1
Paralysis without specified cause	.....	.....	.....	1	.....	1	2
General paralysis	3	.....	.....	1	.....	1	5
Other forms of mental alienation	.....	.....	.....	3	.....	1	4
Epilepsy	.....	.....	.....	.....	2	1	3
Convulsions (nonpuerperal, 5 years and over)	1	.....	.....	2	7	10	20
Convulsions (under 5 years)	.....	.....	.....	2	6	9	17
Tetanus	1	3	.....	29	2	3	38
Other diseases of the nervous system	.....	.....	.....	1	1	.....	2
III.—*Diseases of the circulatory system.*							
Pericarditis	4	1	2	2	.....	2	11
Pneumococcus pericarditis	.....	1	.....	.....	.....	.....	1
Acute endocarditis	.....	1	1	7	.....	2	11
Septic endocarditis	1	1	.....	.....	.....	.....	2
Organic diseases of the heart	7	10	8	17	13	22	77
Angina pectoris	.....	.....	.....	3	.....	1	4
Aneurism	1	1	5	5	.....	1	13
Embolism and thrombosis	.....	1	.....	.....	.....	.....	1
Elephantiasis	.....	1	.....	.....	.....	.....	1
Hemorrhages	2	.....	.....	4	4	5	15
Other diseases of the circulatory system	.....	2	.....	7	2	.....	11
IV.—*Diseases of the respiratory system.*							
Diseases of the nasal fossæ	1	.....	.....	.....	.....	.....	1
Diseases of the larynx	.....	1	.....	2	.....	2	5
Acute bronchitis	.....	.....	1	18	5	1	25
Chronic bronchitis	3	.....	.....	6	.....	.....	9
Broncho-pneumonia	20	4	5	14	5	.....	48
Pneumonia	213	86	130	129	64	46	668
Pleurisy	3	.....	1	3	1	.....	8
Congestion and apoplexy of the lungs	1	.....	1	8	.....	.....	10
Gangrene of the lungs	.....	2	1	.....	1	.....	4
Pulmonary emphysema	.....	.....	1	.....	1	.....	2
Other diseases of the respiratory system (phthisis excepted)	1	.....	.....	9	.....	.....	10
V.—*Diseases of the digestive system.*							
Diseases of the mouth and its adnexa	.....	.....	1	.....	.....	1	2
Diseases of the pharynx	.....	.....	.....	1	.....	.....	1
Other diseases of the stomach (cancer excepted)	.....	1	.....	1	.....	.....	2
Diarrhea and enteritis (under 2 years)	3	4	.....	27	15	16	65
Chronic diarrhea and enteritis (under 2 years)	.....	.....	1	10	6	5	22
Diarrhea and enteritis (2 years and over)	2	.....	.....	39	1	7	49
Intestinal parasites	1	.....	.....	6	.....	.....	7
Uncinariasis	.....	1	.....	1	.....	2	4

Causes of death—Continued.

Classification.	Ancon Hospital.	Colon Hospital.	Line Hospital.	Panama.	Colon.	Zone.	Total.
***V.—Diseases of the digestive system*—Continued.**							
Hernia and intestinal obstructions	5	.....	1	7	1	4	18
Other diseases of the intestines	1	.....	.....	22	1	2	26
Cirrhosis of the liver	.....	2	5	6	2	5	20
Biliary calculi	.....	.....	1	2	.....	1	4
Other diseases of the liver	7	2	3	8	5	5	30
Diseases of the spleen	.....	1	.....	.....	.....	.....	1
Simple peritonitis	6	2	3	7	5	4	27
Other diseases of the digestive system (cancer and tuberculosis excepted)	.....	1	.....	14	.....	1	16
Appendicitis and abscess of the iliac fossæ	.....	.....	.....	3	.....	.....	3
VI.—*Diseases of the genito-urinary system and its adnexa.*							
Acute nephritis	7	8	4	16	5	8	48
Bright's disease	27	21	20	50	7	12	137
Other diseases of the kidneys and their adnexa	1	1	.....	3	1	.....	6
Diseases of the bladder	.....	.....	.....	1	.....	.....	1
Diseases of the urethra, urinary abscess, etc	3	.....	.....	.....	.....	1	4
Cysts and other tumors of the ovary	.....	.....	.....	1	.....	.....	1
Other diseases of the female genital organs	.....	.....	.....	1	.....	.....	1
VII.—*The puerperal state.*							
Accidents of pregnancy	1	.....	.....	1	.....	3	5
Puerperal hemorrhage	.....	.....	.....	1	.....	.....	1
Other accidents of labor	1	.....	.....	3	.....	4	8
Puerperal septicæmia	.....	3	.....	1	1	3	8
Puerperal albuminuria and convulsions	.....	.....	.....	2	1	3	6
Other puerperal accidents—sudden death	.....	.....	.....	.....	.....	1	1
VIII.—*Diseases of the skin and cellular tissue.*							
Gangrene	.....	1	2	.....	.....	1	4
Acute abscess, phlegmon	1	.....	.....	1	1	.....	3
Other diseases of the skin and its adnexa	1	.....	.....	2	.....	.....	3
IX.—*Diseases of the organs of locomotion.*							
Nontuberculous diseases of the bones	.....	.....	.....	2	.....	.....	2
Arthritis and other diseases of the joints (tuberculosis and rheumatism excepted)	1	.....	1	.....	.....	.....	2
Amputation	1	.....	.....	.....	.....	.....	1
Other diseases of the organs of locomotion	.....	.....	.....	1	.....	.....	1
X.—*Malformations.*							
Congenital malformations (stillbirths excepted)	2	9	3	8	19	24	65
XII.—*Old age.*							

[redacted]

Monthly report of hospitals for the year ending June 30, 1907.

JULY, 1906.

Hospitals.	Patients in hospital first of month.				Admitted during month.				Died during month.				Discharged during month.				Patients in hospital end of month.			
	Canal employees.	Railroad employees.	Non-employees.	Total.	Canal employees.	Railroad employees.	Non-employees.	Total.	Canal employees.	Railroad employees.	Non-employees.	Total.	Canal employees.	Railroad employees.	Non-employees.	Total.	Canal employees.	Railroad employees.	Non-employees.	Total.
Ancon	330	43	63	436	1,405	69	112	1,586	72	2	11	85	1,340	80	113	1,533	323	30	51	404
Colon	173	50	57	280	854	183	235	1,272	24	4	18	46	738	183	166	1,087	265	46	108	419
Miraflores	79	20	107	206	242	11	28	281	10	.....	10	20	228	26	31	285	83	5	94	182
Gorgona	27	1	.....	28	140	13	4	157	3	.....	2	5	140	12	1	153	24	2	1	27
Culebra	48	3	.....	51	307	2	7	316	21	.....	1	22	271	3	5	279	63	2	1	66
Empire	13	.....	.....	13	301	.....	7	308	9	.....	1	10	291	.....	6	297	14	.....	.....	14
Bas Obispo	.....	.....	.....	.....	99	4	1	104	3	.....	.....	3	80	3	1	84	16	1	.....	17
Tabernilla	.....	.....	.....	.....	381	32	9	422	17	.....	.....	17	309	27	6	342	55	5	3	63
Total	670	117	227	1,014	3,729	314	403	4,446	159	6	43	208	3,397	334	329	4,060	843	91	258	1,192

AUGUST, 1906.

Ancon	323	30	51	404	1,170	71	120	1,361	55	3	11	69	1,081	46	76	1,203	357	52	84	493
Colon	265	46	108	419	897	188	188	1,273	18	5	19	42	918	181	205	1,304	226	48	72	346
Miraflores	83	5	94	182	236	4	26	266	12	.....	8	20	219	2	13	234	88	7	99	194
Gorgona	24	2	1	27	157	29	2	188	5	.....	1	6	148	31	1	180	28	.....	1	29
Culebra	63	2	1	66	342	4	2	348	23	.....	.....	23	328	6	2	336	54	.....	1	55
Empire	14	.....	.....	14	335	.....	2	337	4	.....	.....	4	331	.....	2	333	14	.....	.....	14
Bas Obispo	16	1	.....	17	114	10	2	126	9	.....	.....	9	101	11	1	113	20	.....	1	21
Tabernilla	55	5	3	63	426	59	.....	485	10	2	.....	12	415	57	3	475	56	5	.....	61
Taboga	48	5	2	55	166	14	16	196	.....	.....	.....	.....	189	18	17	224	25	1	1	27
Total	891	96	260	1,247	3,843	379	358	4,580	136	10	39	185	3,730	352	320	4,402	868	113	259	1,240

[redacted]

eport of hospitals for the year ending June 30, 1907—Continued.

SEPTEMBER, 1906.

	Admitted during month.				Died during month.				Discharged during month.				Patients in hospital end of month.			
l.	Canal employees.	Railroad employees.	Non-employees.	Total.	Canal employees.	Railroad employees.	Non-employees.	Total.	Canal employees.	Railroad employees.	Non-employees.	Total.	Canal employees.	Railroad employees.	Non-employees.	Total.
3	708	82	92	882	42	3	13	58	758	70	92	920	265	61	71	397
6	716	146	141	1,003	25	5	10	40	686	133	140	959	231	56	63	350
4	154	21	18	193	12	.....	8	20	170	16	13	199	60	12	96	168
9	136	.....	4	140	5	.....	1	6	139	.....	4	143	20	.....	.....	20
5	236	.....	5	241	17	.....	2	19	239	.....	4	243	34	.....	.....	34
4	267	.....	6	273	3	.....	.....	3	265	.....	6	271	13	.....	.....	13
1	129	4	4	137	4	.....	.....	4	129	1	4	134	16	3	1	20
1	212	53	.....	265	2	.....	.....	2	245	53	.....	298	21	5	.....	26
7	125	4	23	152	.....	.....	.....	.....	123	2	22	147	27	3	2	32
..	161	2	2	165	5	.....	.....	5	135	2	2	139	21	.....	.....	21
0	2,844	312	295	3,451	115	8	34	157	2,889	277	287	3,453	708	140	233	1,081

OCTOBER, 1906.

7	839	100	89	1,028	31	4	9	44	804	93	84	981	209	64	67	400
0	624	111	110	845	25	5	20	50	629	128	99	856	201	34	54	289
8	17	4	45	66	4	1	11	16	49	7	22	78	24	8	108	140
0	134	.....	5	139	1	.....	1	2	139	.....	3	142	14	.....	1	15
4	189	.....	.....	189	9	.....	.....	9	182	.....	.....	182	32	.....	.....	32
3	65	.....	1	66	3	.....	.....	3	71	.....	1	72	4	.....	.....	4
0	78	3	2	83	2	.....	.....	2	81	6	3	90	11	.....	.....	11
6	94	47	.....	141	4	.....	.....	4	106	44	.....	150	5	8	.....	13
1	103	2	8	113	4	.....	.....	4	110	2	8	120	10	.....	.....	10
..	85	1	1	87	3	.....	1	4	72	1	.....	73	10	.....	.....	10
2	133	6	25	164	.....	.....	.....	.....	127	8	24	159	33	1	3	37
1	2,361	274	286	2,921	86	10	42	138	2,370	289	244	2,903	613	115	233	961

NOVEMBER, 1906.

Ancon	269	64	67	400	684	56	80	820	24	1	4	29	633	62	76	771	296	57	67	420
Colon	201	34	54	289	587	128	112	827	23	4	21	48	610	116	71	797	155	42	74	271
Culebra	32	.....	.....	32	120	.....	.....	120	1	.....	.....	1	119	.....	.....	119	32	.....	.....	32
Miraflores	24	8	108	140	24	2	30	56	1	.....	9	10	29	3	18	50	18	7	111	136
Gorgona	14	.....	1	15	60	.....	2	62	1	.....	2	3	69	.....	1	70	4	.....	.....	4
Bas Obispo	11	.....	.....	11	55	3	.....	58	2	.....	.....	2	56	3	.....	59	8	.....	.....	8
Las Cascadas	10	.....	.....	10	59	1	.....	60	1	.....	.....	1	61	1	.....	62	7	.....	.....	7
Empire	4	.....	.....	4	83	2	.....	85	2	.....	.....	2	81	2	.....	83	4	.....	.....	4
Paraiso	10	.....	.....	10	68	.....	.....	68	2	.....	.....	2	68	.....	.....	68	8	.....	.....	8
Tabernilla	5	8	.....	13	68	11	.....	79	1	.....	.....	1	72	19	.....	91	.....	.....	.....	.....
Taboga	33	1	3	37	89	3	23	115	.....	.....	.....	.....	89	3	21	113	33	1	5	39
Total	613	115	233	961	1,897	206	247	2,350	58	5	36	99	1,887	209	187	2,283	565	107	257	929

DECEMBER, 1906.

Ancon	296	37	67	420	1,004	92	69	1,165	40	3	8	51	965	85	77	1,127	295	61	51	407
Colon	155	42	74	271	514	141	101	756	7	2	14	23	499	141	99	739	163	40	62	265
Culebra	29	.....	.....	29	167	.....	.....	167	8	.....	.....	8	159	.....	.....	159	29	.....	.....	29
Miraflores	18	7	111	136	14	1	16	31	3	.....	8	11	10	.....	21	31	19	8	98	125
Bas Obispo	8	.....	.....	8	61	3	.....	64	4	.....	.....	4	56	3	.....	59	9	.....	.....	9
Empire	4	.....	.....	4	109	3	1	113	1	.....	.....	1	105	3	.....	108	7	.....	1	8
Paraiso	8	.....	.....	8	69	.....	.....	69	1	.....	.....	1	70	.....	.....	70	6	.....	.....	6
Las Cascadas	7	.....	.....	7	86	2	3	91	.....	.....	.....	.....	84	2	2	88	9	.....	1	10
Gorgona	4	.....	.....	4	87	.....	2	89	2	.....	1	3	82	.....	2	84	6	.....	.....	6
Taboga	34	.....	5	39	125	.....	19	144	.....	.....	.....	.....	131	.....	17	148	28	.....	7	35
Total	563	106	257	926	2,236	242	211	2,680	66	5	31	102	2,161	234	218	2,613	571	109	220	900

port of hospitals for the year ending June 30, 1907—Continued.

JANUARY, 1907.

tients remaining last month.			Admitted.			Died.			Discharged.			Patients remaining at end of month.		
	Non-employees.	Total.	Employees.	Non-employees.	Total.	Employees.	Non-employees.	Total.	Employees.	Non-employees.	Total.	Employees.	Non-employees.	Total.
56	51	407	1,264	99	1,363	28	3	31	1,201	84	1,285	396	58	454
33	62	265	669	105	774	20	13	33	675	82	757	177	72	249
29	.....	29	160	.....	160	7	.....	7	154	.....	154	28	.....	28
27	98	125	19	34	53	4	5	9	23	12	35	19	115	134
9	.....	9	72	2	74	2	.....	2	62	2	64	12	.....	12
6	.....	6	134	2	136	.....	.....	.....	68	1	69	11	.....	11
7	1	8	140	3	143	1	.....	1	45	2	47	7	2	9
6	.....	6	72	.....	72	2	.....	2	67	.....	67	7	.....	7
9	1	10	141	4	145	.....	2	2	109	1	110	24	1	25
28	7	35	150	33	183	.....	.....	.....	141	36	177	36	4	40
80	220	900	2,821	282	3,103	64	23	87	2,545	220	2,765	717	252	969

FEBRUARY, 1907.

96	58	454	1,022	54	1,076	36	5	41	887	57	944	409	47	456
77	72	240	607	83	690	23	14	37	553	82	635	208	59	267
28	.....	28	168	2	170	6	.....	6	155	1	156	35	1	36
19	115	134	22	23	45	6	7	13	19	14	33	16	117	133
12	.....	12	88	2	90	1	.....	1	68	1	69	20	.....	20
11	.....	11	91	2	93	1	.....	1	80	2	82	13	.....	13
7	2	9	118	.....	118	.....	.....	.....	64	2	66	7	.....	7
24	1	25	123	1	124	1	.....	1	126	2	128	15	.....	15
7	.....	7	69	.....	69	1	.....	1	66	.....	66	8	.....	8
36	4	40	121	45	166	.....	.....	.....	126	44	170	31	5	36
17	252	969	2,429	212	2,641	75	26	101	2,144	205	2,349	762	229	991

MARCH, 1907.

Ancon	409	47	456	992	82	1,074	38	6	44	1,002	69	1,071	290	51	341
Colon	208	59	267	596	89	685	42	16	58	549	74	623	199	58	257
Culebra	35	1	36	151	1	152	8	.....	8	135	2	137	42	.....	42
Miraflores	16	117	133	18	23	41	5	5	10	15	13	28	14	122	136
Las Cascadas	15	.....	15	88	4	92	2	.....	2	85	3	88	5	.....	5
Bas Obispo	20	.....	20	82	.....	82	1	.....	1	78	.....	78	6	.....	6
Paraiso	8	.....	8	93	.....	93	1	.....	1	92	.....	92	6	.....	6
Gorgona	13	.....	13	82	2	84	3	.....	3	74	1	75	9	.....	9
Empire	7	.....	7	85	.....	85	1	.....	1	34	.....	34	6	.....	6
Taboga Sanitarium	31	5	36	147	42	189	.....	.....	.....	146	35	181	32	12	44
Total	762	229	991	2,334	243	2,577	101	27	128	2,210	197	2,407	609	243	852

APRIL, 1907.

Ancon	290	51	341	880	83	963	61	9	70	675	68	743	372	56	428
Colon	199	58	257	430	92	522	32	20	52	415	70	485	174	57	231
Culebra	42	.....	42	118	1	119	7	.....	7	127	.....	127	24	1	25
Miraflores	10	40	50	6	10	16	.....	5	5	13	6	19	2	30	41
Gorgona	9	.....	9	63	1	64	1	1	2	49	.....	49	6	.....	6
Paraiso	6	.....	6	62	.....	62	4	.....	4	52	.....	52	8	.....	8
Las Cascadas	5	.....	5	53	3	56	.....	.....	.....	40	1	41	4	1	5
Bas Obispo	6	.....	6	44	.....	44	.....	.....	.....	30	.....	30	2	.....	2
Empire	6	.....	6	43	.....	43	1	.....	1	20	.....	20	3	.....	3
Taboga Sanitarium	30	7	37	149	33	182	.....	.....	.....	151	32	183	28	8	36
Total	603	156	759	1,848	223	2,071	106	35	141	1,572	177	1,749	623	162	785

MAY 1907.

Ancon	372	56	428	886	81	967	41	5	46	752	73	825	449	59	508
Colon	174	57	231	309	99	408	19	13	32	307	70	377	151	72	223
Culebra	24	1	25	95	.....	95	8	1	9	73	.....	73	34	.....	34
Gorgona	6	.....	6	33	.....	33	.....	.....	.....	19	.....	19	6	.....	6
Las Cascadas	4	1	5	61	1	62	2	.....	2	46	2	48	7	.....	7
Miraflores	8	117	125	9	12	21	1	5	6	9	8	17	7	116	123
Paraiso	8	.....	8	63	.....	63	.....	.....	.....	57	.....	57	7	.....	7
Bas Obispo	2	.....	2	35	.....	35	1	.....	1	18	.....	18	6	.....	6
Empire	3	.....	3	33	.....	33	2	.....	2	15	.....	15	5	.....	5
Taboga Sanitarium	28	8	36	113	22	135	.....	.....	.....	118	27	145	23	3	26
Total	629	240	869	1,647	215	1,852	74	24	98	1,414	180	1,594	695	250	945

port of hospitals for the year ending June 30, 1907—Continued.

JUNE, 1907.

ients remaining last month.			Admitted.			Died.			Discharged.			Patients remaining at end of month.		
	Non-employees.	Total.	Employees.	Non-employees.	Total.	Employees.	Non-employees.	Total.	Employees.	Non-employees.	Total.	Employees.	Non-employees.	Total.
9	59	508	960	105	1,065	31	5	36	866	76	924	423	82	505
1	72	223	545	107	652	21	12	33	382	86	468	285	78	363
4	.....	34	123	2	125	6	1	7	113	.....	113	36	1	37
..	.....	.....	139	.....	139	.....	.....	.....	102	.....	102	15	.....	15
6	.....	6	72	.....	72	.....	.....	.....	54	.....	54	9	.....	9
7	.....	7	68	1	69	.....	.....	.....	60	.....	60	13	.....	13
5	.....	5	74	.....	74	1	.....	1	61	.....	61	12	.....	12
6	.....	6	43	1	44	1	1	2	21	.....	21	8	.....	8
7	.....	7	62	.....	62	4	.....	4	53	.....	53	7	.....	7
7	116	123	6	15	21	.....	2	2	5	13	18	5	114	119
3	3	26	168	29	197	.....	.....	.....	158	25	183	35	7	42
5	250	945	2,260	260	2,520	64	21	85	1,875	200	2,075	848	282	1,130

Monthly report of hospitals for the year ending June 30, 1907—Continued.

	Total number of employees remaining in hospitals.	Total number of employees constantly sick in hospitals during month.	Average number sick daily in hospitals, per thousand.	Total number of employees constantly sick in sick camp during month.	Average number sick daily in sick camps, per thousand.	Total number of employees constantly sick in hospitals and sick camps during the month.	Total average number sick daily in hospitals and sick camps, per thousand.
1906.							
July	935	888.52	31.68	219.41	7.82	1,107.93	39.50
August	976	995.74	33.72	264.83	8.95	1,260.57	42.67
September	848	821.88	29.09	243.10	8.65	1,064.98	37.74
October	728	719.30	28.20	138.35	5.42	857.65	33.62
November	672	688.88	26.62	110.59	4.27	799.47	30.89
December	680	766.52	26.13	130.15	4.44	896.67	30.57
1907.							
January	717	744.12	23.36	106.55	3.35	850.67	26.71
February	762	741.11	20.41	156.77	4.32	897.88	24.73
March	609	706.02	19.40	130.05	3.57	836.07	22.97
April	623	728.33	19.08	94.39	2.44	822.72	21.52
May	695	656.70	16.84	84.11	2.15	740.81	18.99
June	848	757.23	19.09	108.23	2.72	865.46	21.82
Total	9,093	9,214.35	293.62	1,786.53	58.10	11,000.78	351.73
Average, per month, for the year	757	767.86	24.46	148.87	4.84	916.73	29.31

Summary of the work of the sanitary department in the city of Panama for the fiscal year 1906–7.

Street cleaning and garbage collection:	
Daily average number of men at work during the year	51
Daily average number of cars used during the year	18
Total number loads of sweepings	10,921
Total number loads of garbage	25,743
Total number of miscellaneous loads carted	15
Times street-sweeping machines used	90
Street sprinkling:	
Times street sprinklers used	745
Number of gallons sprinkled on streets	2,736,509
Inspection of yards:	
Houses inspected and found in good condition	1,274
Houses inspected and found in bad condition	598
Houses with water connections	1,456
Houses without water connections	605
Houses with sewer connections	1,418
Houses without sewer connections	619
Water-closets in good condition	1,348
Water-closets in bad condition	481
Yards with drainage good	1,189
Yards with drainage bad	352
Traps in yards connected with sewer	1,489
Traps in yards not connected with sewer	252
Tanks on premises	18
Wells on premises	79
Persons notified as to insanitary condition of their yards	1,766
Persons notified to connect with water and sewers	62
Persons warned for having mosquito larvæ	1,116
Persons fined by local authorities	79
Places where mosquito larvæ were found	1,470
House cleaning and whitewashing (for first three months):	
Daily average number of men at work	29
Total number of rooms cleaned	872
Total number of rooms whitened	1,597
Total number of walls whitened	809
Total number of yards cleaned	32
Total number of carts of rubbish removed	12

Sanitation of the Canal Zone, by months, for the fiscal year 1907.

	Brush cut and burned or removed.	Swamps drained and filled.	Grass cut and burned.	New ditches dug.	Tile drain laid.	New ditches stoned and cemented and V-shaped.	Old ditches stoned and cemented	Old ditches cleaned and graded.
1906.	*Square yards.*	*Square yards.*	*Square yards.*	*Linear feet.*	*Linear feet.*	*Linear feet.*	*Linear feet.*	*Linear feet.*
July	1,214,143	500,150	1,260,805	7,276	.....	1,369	125	140,296
August	1,318,096	157,316	1,142,750	13,979	.....	1,233	61	245,054
September	2,104,556	15,303	1,130,501	23,964	.....	1,364	710	186,810
October	516,262	12,192	2,293,561	10,441	422	2,345	160	167,219
November	646,709	7,719	4,056,472	13,154	863	3,454	2,895	153,422
December	2,521,932	25,839	5,349,135	15,007	487	5,136	441	146,152
1907.								
January	2,050,929	57,276	6,515,573	22,769	6,594	2,465	1,600	183,217
February	2,145,663	51,788	3,109,352	22,379	7,972	2,444	734	183,035
March	1,720,413	69,972	1,350,127	18,351	16,048	2,843	1,588	130,219
April	643,001	2,936	432,146	28,058	8,272	5,331	2,116	129,911
May	716,068	15,742	1,140,843	19,384	2,513	2,926	344	197,596
June	339,263	87,698	2,581,224	22,545	6,510	5,846	799	164,081
Total	15,937,035	1,003,931	30,362,489	217,307	49,691	36,756	11,573	2,027,012

	Closet pits dug.	Closet pits filled in.	Closets erected.	Closets cared for.	Garbage cans emptied.	Night-soil cans emptied.	Houses disinfected.	Houses fumigated.
1906.	*Cubic feet.*	*Cubic yards.*						*Cubic feet.*
July	.....	.....	.....	.....	54,660	25,200	.....	1,536,671
August	.....	.....	.....	.....	58,980	24,240	.....	1,014,705
September	.....	.....	.....	.....	64,650	22,860	.....	620,098
October	2,025	175	33	380	66,420	23,790	15	331,509
November	2,457	141	85	546	70,680	24,030	7	281,210
December	4,068	314	140	860	74,160	24,840	8	345,315
1907.								
January	15,039	206	93	876	82,367	26,505	9	373,205
February	14,985	147	72	934	81,732	29,260	12	628,826
March	12,528	451	75	1,057	89,931	31,248	60	1,348,954
April	8,154	211	43	877	86,970	30,660	105	1,076,372
May	15,714	174	59	882	79,572	33,077	87	2,107,154
June	17,172	420	127	1,038	95,550	30,300	52	1,380,986
Total	92,142	2,239	727	7,450	905,672	326,010	355	11,055,005

Sick inspection:	
Number of hotels inspected (daily)	28
Number of persons reported ill	358
New buildings:	
Plans of houses to be constructed, submitted to health officer and approved	201

Summary of the work of the sanitary department for the fiscal year 1906–7 in the cities of Colon and Cristobal (including Mount Hope, Gatun, and Brazos Camp).

Sanitation, Cristobal:	
Number of cans of garbage removed	105,818
Number of loads of yard garbage carted	5,846
Number of blocks of street cleaned	4,215,903
Miscellaneous loads carted	373
Number of cans of night soil removed	128,231
Number of night-soil cans installed	141
Number of loads to and from storehouse	67
Stegomyia mosquito brigade, Cristobal:	
Square yards of vegetation removed	131,485
Water receptacles overturned	4,939
Water receptacles destroyed	35
Water receptacles collected	70,656
Barrels spigoted	125
Barrels covered	253
Barrels oiled	559
Square yards of lagoon oiled	29,954
Crab holes oiled	30,566
Crabs killed	10,571
Pools oiled	17,745
Barrels destroyed	242
Tanks oiled	1,603
Number of feet of concrete drain cleaned	264,305
Total number of breeding places eradicated	1,104
[illegible]ion, Colon:	
[illegible]umber of cans of garbage removed	308,328
[illegible]ads of yard garbage carted	2,662
[illegible]umber of cans of night soil removed	523,947
[illegible]cellaneous loads carted	741
[illegible]mber of nuisances reported	565
[illegible]mber of nuisances abated	221
[illegible]mber of yards inspected	583
[illegible]are yards of street watered	6,664,630
[illegible]d dirt unloaded	2,427
[illegible]are yards of street cleaned	910,439
[illegible]ber of night-soil cans installed	1,396
[illegible]s to and from storehouse	554
[illegible]ber of new water-closets built	223
[illegible]e brigade, Colon:	
[illegible]are yards of vegetation removed	2,146,559
[illegible] receptacles overturned	48,185
[illegible] receptacles collected	551,866
[illegible]-closets oiled	5,628
[illegible]ls spigoted	1,367
[illegible]ls covered	8,605
[illegible]ls destroyed	9,661
[illegible]ls elevated	11
[illegible]ls oiled	3,802
[illegible]oiled	353
[illegible]oiled	574
[illegible]oiled	59,955
[illegible]oles [illegible]iled	6,613
[illegible]are yar[illegible]of lagoon oiled	844,290
[illegible]ber of [illegible]ear feet of drainage made	2,640
[illegible]ber of [illegible]et of drain oiled and cleaned	963,654
[illegible]ding p[illegible]es eradicated	8,688

Disbursements:	
July 1, 1906, to June 30, 1907	$14,911,596.79
(These figures include $3,250,000 paid on account of the Panama Railroad Company, the remainder being for material and supplies, personal service, transportation, cablegrams, etc., for account of the Commission.)	
Miscellaneous receipts:	
Collected and deposited in United States Treasury, July 1, 1906, to June 30, 1907	589,049.04
Liquidated damages:	
Collected for breach of contracts, July 1, 1906, to June 30, 1907	34,531.19

The appointment division handled all work of the Washington office in connection with the personnel (other than laborers) of the Isthmian Canal Commission in the United States and elsewhere, including all correspondence and records, appointments and transportation to the Isthmus; arranged return transportation to the Isthmus for employees on leave and members of their families; had supervision over the employment agents, and conducted all correspondence with the Civil Service Commission and made reports thereto.

During the period from July 1, 1906, to June 30, 1907, 4,996 persons within the United States were tendered employment on the Isthmus in grades above that of laborer. Of this number, 3,927 accepted and were accordingly appointed, covering 107 different positions. Of the number who accepted and were appointed, 3,224 persons have been transported to their places of duty (3,021 via New York, 156 via New Orleans, and 47 via San Francisco), the remainder having failed to sail after selection and appointment. Eight hundred and ninety-nine members of families of employees and 1,133 persons returning from leave of absence have been furnished transportation during this period from New York City over the Panama Railroad Company's line of steamers, and a limited number via New Orleans and San Francisco—over 5,300 persons in all having been provided first-class transportation from the United States to the Isthmus during the fiscal year under review.

The work of the correspondence division included all general correspondence, the codifying and deciphering of all cables between the Washington office and the Isthmus, and the mailing of letters

shipping agents, and provision is made for distribution of these circulars from the offices of the Engineer Department, and of the Quartermaster's Department, United States Army, and through commercial agencies in certain cities. The published advertisements show where circulars inviting bids may be obtained, and the arrangement made for distribution enables all persons desiring to bid to obtain circulars within a short time after they are issued.

The Commission maintains the practice of calling for bids on materials and supplies delivered on the Isthmus, thereby giving each section of the country equal opportunity in furnishing the materials required, so that the manufacturers, railways, and steamship lines in each locality and through each port may figure on the business on a combination of prices and transportation rates.

The total amount of purchases made by this department during the year ending June 30, 1907, was $8,759,227.26, the more important items included in this total being 40 mogul freight locomotives, 300 dump cars, 7 steam shovels, 10 earth spreaders, 26 unloaders and unloader plows, 3 20-ton electric cranes, 4 25-ton locomotive cranes, 6 air compressors, 24 rock channelers, 50 rock drills, 45 churn drills, 2 pipe line suction dredges, 1 dipper dredge, 6 steel dump barges, 2 filtration plants, 16,000 tons steel rail, and 36,500,000 feet lumber.

At the close of the fiscal year a change in the organization of the Washington office was in progress, which has resulted in simplifying methods and reducing expenses.

Very respectfully,

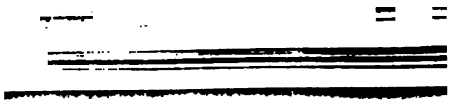
H. F. HODGES,
Lieut. Col., Corps of Engineers, U. S. Army,
General Purchasing Officer, Chief of Office.

Lieut. Col. GEORGE W GOETHALS,
Corps of Engineers, U. S. Army, Chairman and Chief Engineer, Isthmian Canal Commission, Culebra, Canal Zone.

No.		Contingent expenses.			Miscellaneous.		
		Washington.	Isthmus.	Total.	Washington.	Isthmus.	Total.
1	Isthm						
2	Comn	$4,530.78	$145.00	$4,385.78	.....	$1,199.60	$1,199.60
3	Specia	2,538.15	.....	2,538.15	$280.00	.....	280.00
		66.65	434.07	500.72	.....	.....	.....
	B	1,925.93	579.07	1,346.86	280.00	1,199.60	919.60
11	Office						
12	Office	29,243.67	49.66	29,293.33	.....	216.75	216.75
13	Office	411.65	6.00	417.65	.....	.....	.....
14	Office	1,161.60	236.25	1,397.85	.....	863.77	863.77
15	Office	2,373.52	.....	2,373.52	.....	.....	.....
16	Trans	535.40	3,869.31	4,404.71	.....	1,054.86	1,054.86
17	Rent, Wa	3,798.32	.....	3,798.32	.....	.....	.....
18	Depre	24,428.76	.....	24,428.76	.....	.....	.....
		.....	.....	.....	.....	.....	.....
		61,952.92	4,161.22	66,114.14	.....	1,701.88	1,701.88
	DE						
31	The e						
32	Admi	142.81	2,700.91	2,843.72	.....	290.37	290.37
33	The Z	.....	238.33	238.33	.....	2,864.67	2,864.67
34	Office	.....	180.00	180.00	.....	.....	.....
35	Posta	448.14	775.11	1,223.25	.....	.....	.....
36	Divis	.....	20,819.64	20,819.64	.....	4.84	4.84
37	Police	.....	1,054.20	1,054.20	.....	21.90	21.90
38	Penal	.....	2,259.34	2,259.34	.....	383.10	383.10
39	Distri	.....	6,317.49	6,317.49	.....	8,910.90	8,910.90
40	Fire p	3.00	310.23	313.23	.....	400.29	400.29
41	Milita	.....	308.38	308.38	.....	28.00	28.00
42	Maint sew	.....	63.19	63.19	.....	722.61	722.61
43	Maint sew	.....	537.92	537.92	.....	2.00	2.00
		.....	124.35	124.35	.....	.....	.....
		593.95	35,689.09	36,283.04	.....	12,183.46	12,183.46
61	Office						
62	Office	.....	3,944.33	3,944.33	.....	.....	.....
63	Ancon	.....	15.67	15.67	.....	.....	.....
64	Colon	21.25	5,911.75	5,933.00	.....	43,906.05	43,906.05
65	Other	21.75	7,911.99	7,933.74	.....	16,084.09	16,084.09
66	Office	.....	14,742.88	14,742.88	.....	15,569.29	15,569.29
67	Quara	.....	8.85	8.85	.....	.....	.....
68	Quara	.....	497.87	497.87	.....	3,335.40	3,335.40
69	City s	.....	706.45	706.45	.....	4,788.62	4,788.62
70	City s	.....	3,114.44	3,114.44	.....	.....	.....
71	Zone s	.....	17,455.31	17,455.31	.....	1,391.62	1,391.62
72	Care o	.....	27,359.12	27,359.12	.....	6.42	6.42
73	Fire p	.....	248.65	248.65	.....	968.70	968.70
74	Santo	.....	.....	.....	.....	.....	.....
75	Labor	.....	.....	.....	.....	.....	.....
76	Milita	18.00	13.07	4.93	.....	.....	.....
		.....	.....	.....	.....	.....	.....
		25.00	80,934.64	80,959.64	.....	86,037.35	86,037.35
	DEPA						
101	Office						
102	Divisi	1.00	5,014.18	5,015.18	.....	10.70	10.70
103	Divisi	46,788.79	5,086.52	51,875.31	.....	6,654.46	6,654.46
104	Depre	.....	644.49	644.49	.....	.....	.....
101½	Office	.....	.....	.....	.....	.....	.....
		.....	14.63	14.63	.....	.....	.....
		46,789.79	10,759.82	57,549.61	.....	6,665.16	6,665.16

S. I

No.			Contingent expenses.			Miscellaneous.		
			Washington.	Isthmus.	Total.	Washington.	Isthmus.	Total.
111	Of							
112	Co	97	.....	$5,674.25	$5,674.25	.....	$78.96	$78.96
113	Co	94	.....	4.80	4.80	.....	7.50	7.50
114	Co	71	.....	4,582.01	4,582.01	.....	41.04	41.04
115	Co	05	.....	1,588.05	1,588.05	.....	7,225.81	7,225.81
116	Co	96	.....	6,644.19	6,644.19	.....	.....	.....
117	Co	37	.....	69.02	69.02	.....	.....	.....
118	Co	00	.....	2,673.22	2,673.22	.....	406.58	406.58
119	Co	32	.....	620.27	620.27	.....	4.08	4.08
120	Co	92	.....	697.01	697.01	.....	.....	.....
121	Re	23	.....	87.64	87.64	.....	.....	.....
122	Re	04	.....	1,643.38	1,643.38	.....	.....	.....
123	Re	68	.....	1,544.55	1,544.55	.....	2.71	2.71
124	Re	66	.....	647.71	647.71	.....	.....	.....
125	Re	67	.....	1,780.89	1,780.89	.....	.....	.....
126	Re	74	.....	21.79	21.79	.....	.....	.....
127	Re	45	.....	48.00	48.00	.....	.....	.....
128	Re	77	.....	233.43	233.43	.....	.....	.....
129	De	68	.....	71.19	71.19	.....	30.29	30.29
130	Co		.....	.....	.....	.....	.....	.....
131	Re	91	.....	1,149.18	1,149.18	.....	.....	.....
132	Cl	41	.....	14.19	14.19	.....	.....	.....
		87	.....	526.46	526.46	.....	.....	.....
		35	.....	30,321.23	30,321.23	.....	7,578.42	7,578.42
141	Of							
142	Sh	82	.....	38.66	38.66	.....	43.51	43.51
143	Re	15	.....	839.30	839.30	.....	163.63	163.63
144	Re	83	$2.70	4,876.30	4,873.60	.....	199.99	199.99
145	Re	23	.....	2,709.42	2,709.42	.....	1,480.18	1,480.18
146	Re	29	.....	326.94	326.94	.....	196.08	196.08
147	Re	22	.....	596.07	596.07	.....	130.10	130.10
148	Re	49	.....	311.69	311.69	.....	.....	.....
149	Re	72	.....	171.55	171.55	.....	46.37	46.37
150	Re	22	.....	4,023.85	4,023.85	.....	.....	.....
151	Op	02	.....	243.66	243.66	.....	1,762.49	1,762.49
152	Sh	03	.....	658.21	658.21	.....	.....	.....
		14	.....	11,489.65	11,489.65	.....	5,509.68	5,509.68
		16	2.70	26,285.30	26,282.60	.....	9,532.08	9,532.08
161	Of							
162	Co	27	.....	1,068.26	1,068.26	.....	766.92	766.92
163	Co	17	.....	11,482.84	11,482.84	.....	1.04	1.04
164	Ma	11	.....	3,884.36	3,884.36	.....	.....	.....
165	Ma		.....	.....	.....	.....	.....	.....
166	Co		.....	.....	.....	.....	.....	.....
167	Ma	06	.....	26,897.72	26,897.72	.....	453.18	453.18
168	St	03	.....	2,398.72	2,398.72	.....	41.98	41.98
169	St	15	.....	5,672.30	5,672.30	.....	4,925.79	4,925.79
170	Co	50	.....	23,926.94	23,926.94	.....	1,080.20	1,080.20
171	De	79	.....	20,966.18	20,966.18	.....	654.00	654.00
			.....	.....	.....	.....	.....	.....
		08	.....	96,297.32	96,297.32	.....	6,565.11	6,565.11

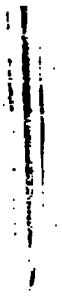


No.			Contingent expenses.			Miscellaneous.		
			Washington.	Isthmus.	Total.	Washington.	Isthmus.	Total.
181	E	64	$115.00	$3,795.46	$3,910.46	.....	$944.86	$944.86
182	S	44	73.95	132.86	206.81	.....	.....	.....
183	E	79	.....	43,353.77	43,353.77	.....	1,197.75	1,197.75
184	D	41	.....	1,253.61	1,253.61	.....	9,082.71	9,082.71
185	T	75	.....	11,719.61	11,719.61	.....	888.99	888.99
186	T	54	.....	2,411.10	2,411.10	.....	.....	.....
187	G	08	.....	12,617.19	12,617.19	.....	.....	.....
188	T	98	.....	33,276.52	33,276.52	.....	420.71	420.71
189	S	98	.....	8,011.30	8,011.30	.....	.....	.....
190	D		.....	.....	.....	.....	.....	.....
191	O							
		70	.....	223.56	223.56	.....	361.58	361.58
192	C	71	.....	117,981.51	117,981.51	.....	761.07	761.07
193	T	03	.....	71,457.68	71,457.68	.....	27.32	27.32
194	L		.....	11,449.17	11,449.17	.....	11,095.00	11,095.00
195	G	12	.....	20,191.76	20,191.76	.....	.....	.....
196	G	67	7.65	7,342.26	7,349.91	.....	117.50	117.50
197	G	45	.....	1,655.08	1,655.08	.....	.....	.....
198	R	53	.....	1,125.04	1,125.04	.....	.....	.....
199	C		.....	482.18	482.18	.....	.....	.....
200	L	77	.....	1,087.82	1,087.82	.....	.....	.....
201	S	48	.....	146.03	146.03	.....	.....	.....
202	C	08	.....	3,065.28	3,065.28	.....	.....	.....
203	P	19	.....	84.41	84.41	.....	.....	.....
204	P	84	.....	138.17	138.17	.....	.....	.....
205	L	62	.....	55.21	55.21	.....	.....	.....
206	L	94	.....	.....	.....	.....	.....	.....
		74	196.60	353,056.58	353,253.18	.....	949.85	949.85
		67	46,983.69	516,720.25	563,703.94	.....	31,290.57	31,290.57
221	L	90	.....	387.46	387.46	.....	15,788.19	15,788.19
222	T		475.81	5,663.60	5,187.79	.....	3,799.56	3,799.56
223	R	86	.....	17,369.81	17,369.81	.....	125.03	125.03
224	E	31	.....	2,503.27	2,503.27	.....	2,278.99	2,278.99
225	F	01	7,368.53	385.34	7,753.87	.....	26.21	26.21
226	S	23	.....	170.32	170.32	.....	.....	.....
227	R	65	.....	30.00	30.00	.....	13,122.55	13,122.55
228	T	61	.....	77.68	77.68	.....	19,025.65	19,025.65
229	F	01	4.80	16,138.06	16,133.26	.....	13,420.78	13,420.78
230	F	19	.....	4,267.87	4,267.87	.....	8,588.25	8,588.25
231	M							
		40	.....	153.63	153.63	.....	.....	.....
232	P	18	.....	59,607.31	59,607.31	.....	19,813.56	19,813.56
233	H							
		04	.....	4,914.10	4,914.10	.....	52,885.40	52,885.40
233	H							
		15	.....	2,982.17	2,982.17	.....	972,506.52	972,506.52
234	C							
		53	.....	1,941.78	1,941.78	.....	.....	.....
235	C	06	.....	373.28	373.28	.....	.....	.....
236	C							
		61	.....	305.00	305.00	.....	61.42	61.42
237	M							
		44	.....	.....	.....	.....	.....	.....
238	M							
		75	.....	.....	.....	.....	15.52	15.52
		93	7,839.54	105,943.48	113,783.02	.....	1,077,220.11	1,077,220.11
	G	56	1,925.93	579.07	1,346.86	$280.00	1,199.60	919.60
	D	07	61,952.92	4,161.22	66,114.14	.....	1,701.88	1,701.88
	D	37	593.95	35,689.09	36,283.04	.....	12,188.46	12,188.46
	D	35	25.00	80,934.64	80,959.64	.....	86,037.35	86,037.35
	D	67	46,983.69	516,720.25	563,703.94	.....	31,290.57	31,290.57
	M	93	7,839.54	105,943.48	113,783.02	.....	1,077,220.11	1,077,220.11
		95	115,469.17	744,027.75	859,496.92	280.00	1,207,238.77	1,207,518.77

No.		Contingent expenses.			Miscellaneous.		
		Washington.	Isthmus.	Total.	Washington.	Isthmus.	Total.
1	Operat54	.....	$58.65	$58.65	.....	$3,783.87	$3,783.87
2	Bas M57	.....	.....	.....	.....	552.36	552.36
3	Cristob5	.....	.....	.....	.....	809.93	809.93
4	Empire5	.....	.....	.....	.....	61.57	61.57
5	Paraiso6	.....	32.12	32.12	.....	.....	.....
6	La Bod0	.....	.20	.20	.....	.....	.....
7	Buildin22	.....	54.70	54.70	.....	16.33	16.33
8	Brass f1	.....	.....	.....	.....	.....	.....
9	Iron fo5	.....	292.59	292.59	.....	.....	.....
10	Pedro 15	.....	.....	.....	.....	8.75	8.75
11	Cristob7	.....	.....	.....	.....	1,940.68	1,940.68
12	Rio Gr9	.....	1,360.64	1,360.64	.....	300.00	300.00
13	Bas Ob1	.....	.....	.....	.....	.....	.....
	T23	.....	1,798.90	1,798.90	.....	6,873.49	6,873.49
	COST O:						
1	Office d6	$13,381.59	.....	13,381.59	.....	.....	.....
2	Office d3	2,739.45	.....	2,739.45	.....	.....	.....
3	Office c leans...	195.77	.....	195.77	.....	.....	.....
4	Office c...	317.10	.....	317.10	.....	.....	.....
6	Service...	25,522.56	.....	25,522.56	.....	.....	.....
7	Divisid9	591.13	37,666.67	38,257.80	.....	27,862.52	27,862.52
8	Freight0	92,856.77	323,821.74	416,678.51	.....	110.26	110.26
	T10	135,604.37	361,488.41	497,092.78	.....	27,752.26	27,752.26

H. L. STUNTZ, *Local Auditor.*

CANAL ZONE, *August 7, 1907.*



APPENDIX K.

ESTIMATE OF APPROPRIATIONS FOR 1908–9.

To continue the construction of a canal connecting the Atlantic and Pacific oceans	$28,906,896.00
Health and sanitation	2,175,190.60
Canal Zone government	688,320.00
Expenses in the United States	198,797.00
Total	31,969,203.60
Supplemental estimate for equipment of Panama Railroad submitted October 17, 1907	1,213,940.00
	33,183,143.60

Estimate of appropriations required to continue the construction of the Isthmian Canal during the fiscal year ending June 30, 1909, compared with appropriations for fiscal year ending June 30, 1908.

Item.	Estimate, 1909.	Appropriation, 1908.
1. For salaries of officers and employees of the Isthmian Canal Commission, including assistant purchasing and shipping agents and all other employees in the United States	$145,422.00	$184,000.00
2. For incidental expenses, including rents, cable and telegraph service, supplies, stationery, and actual necessary traveling expenses in the United States, including rent of the Panama Canal building, in the District of Columbia, $7,500, and text-books and books of reference, $1,000	53,375.00	69,000.00
3. For pay of members of the Commission and officers and employees on the Isthmus, other than skilled and unskilled labor, including civil engineers, superintendents, instrumentmen, transitmen, levelmen, rodmen, draftsmen, timekeepers, mechanical and electrical engineers, supervisors, clerks, accountants, stenographers, storekeepers, messengers, office boys, foremen and subforemen, watchmen, wagonmasters, stewards, hospital dispensers, internes, nurses and attendants, including those necessarily and temporarily detailed for duty away from the Isthmus, for the departments of construction and engineering, disbursing, examination of accounts, and labor, quarters, and subsistence	3,517,911.00	2,772,000.00
4. For skilled and unskilled labor on the Isthmus, including engineers, conductors, firemen, brakemen, electricians, teamsters, cranesmen, machinists, blacksmiths, and other artisans and their helpers, janitors, sailors, cooks, waiters, and dairymen, for the departments of construction and engineering, disbursing, examination of accounts, and labor, quarters, and subsistence	11,429,847.00	7,990,000.00
5. For purchase and delivery of material, supplies, and equipment, including cost of inspecting material and of paying traveling expenses incident thereto, whether on the Isthmus or elsewhere, and such other expenses not in the United States as the Commission deems necessary to best promote the construction of the Isthmian Canal for the departments of construction and engineering, disbursing, examination of accounts, and labor, quarters, and subsistence	11,752,708.00	9,046,000.00
6. For construction of new Panama R. R	*1,750,000.00	1,785,000.00
7. For miscellaneous expenditures, cable and telegraph service, stationery and printing, and traveling and incidental expenses on the Isthmus for the departments of construction and engineering, disbursing, examination of accounts, and labor, quarters and subsistence	456,430.00	558,000.00
8. For pay of officers and employees other than skilled and unskilled labor in the service of the government of the Canal Zone	496,460.00	486,000.00
9. For skilled and unskilled labor in the service of the government of the Canal Zone	73,360.00	50,000.00
10. For material, supplies, equipment, new buildings, and contingent expenses for account of the government of the Canal Zone	118,500.00	229,000.00

Estimate of appropriations required to continue the construction of the Isthmian Canal during the fiscal year ending June 30, 1909, etc.—Continued.

Item.	Estimate, 1909.	Appropriation, 1908.
11. For pay of officers and employees other than skilled and unskilled labor engaged in the sanitation department on the Isthmus	$764,786.00	$766,000.00
12. For skilled and unskilled labor engaged in the sanitation department on the Isthmus	667,003.80	468,000.00
13. For material, supplies, equipment, new buildings, and contingent expenses of the sanitation department on the Isthmus	743,400.80	800,000.00
Total	31,969,203.60	27,161,367.50
Supplemental estimate (under item No. 6) for equipment of Panama R. R., submitted Oct. 17, 1907	1,213,940.00	.....
Grand total	33,183,143.60	.....

*The amount shown under the head of "Appropriation, 1908" was for the "equipment and construction of the Panama Railroad," while for the "Estimate, 1909" the amount includes the construction only, the estimate for equipment being covered under a "Supplemental estimate."

NOTES.

[*Estimates referred to are distributed among items 3, 4, 5, and 7.*]

Estimates of the requirements of the Colon dredging division (extending from the Atlantic Ocean to Gatun locks) are based upon the operation of 2 French ladder dredges, 2 dipper dredges, and 1 seagoing suction dredge, together with necessary tug and clapet service, operation of dry dock and marine shop and excavation by 2 steam shovels.

Estimates of the requirements of the La Boca dredging division (extending from Pedro Miguel to Pacific Ocean) are based upon the operation of 2 ladder dredges, 1 dipper dredge, 1 seagoing suction dredge, 2 steam launches, 7 clapets, shipways, and machine shops.

Construction of proposed new dry dock and shop are not included, as it is assumed that the cost of these will be paid for from subsequent appropriation.

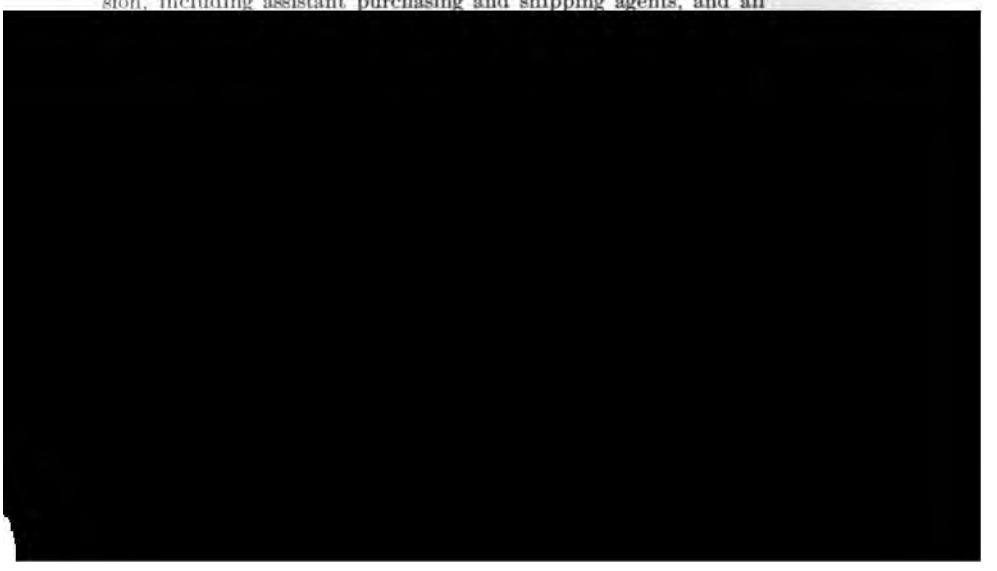
Estimates of the requirements of the department of labor, quarters, and subsistence are based upon the assumption that the act of March 4, 1907, providing for deductions from the pay of employees for transportation, board, supplies, and other service, will remain in force.

Detailed estimate of appropriations, by items, required to continue the construction of the Isthmian Canal during the fiscal year ending June 30, 1909.

To continue the construction of the Isthmian Canal, to be expended under the direction of the President, in accordance with an act entitled "An act to provide for the construction or a canal connecting the waters of the Atlantic and Pacific oceans," approved June 28, 1902..... $31,969,203.60

ITEM 1.

For salaries of officers and employees of the Isthmian Canal Commission, including assistant purchasing and shipping agents, and all



Custodian's force:		
1 engineer and electrician, at $1,400		$1,400.00
1 head watchman, at $840		840.00
2 watchmen, at $720		1,440.00
1 watchman-messenger-fireman, at $720		720.00
1 elevator conductor, at $720		720.00
2 laborers, at $600		1,200.00
1 head charwoman, at $300		300.00
4 charwomen, at $240		960.00
Office of general purchasing officer:		
1 chief clerk, at $3,600		3,600.00
1 clerk, at $1,800		1,800.00
1 clerk, at $1,500		1,500.00
3 clerks, at $1,400		4,200.00
4 clerks, at $1,200		4,800.00
2 clerks, at $1,000		2,000.00
5 clerks, at $900		4,500.00
1 messenger, at $600		600.00
1 messenger, at $420		420.00
1 messenger, at $360		360.00
Temporary clerks for special service		900.00
Office of disbursing officer:		
1 disbursing officer, at $5,000		5,000.00
1 chief clerk, at $2,400		2,400.00
1 clerk, at $1,800		1,800.00
2 clerks, at $1,600		3,200.00
6 clerks, at $1,400		8,400.00
3 clerks, at $1,200		3,600.00
3 clerks, at $1,000		3,000.00
1 clerk, at $900		900.00
1 messenger, at $840		840.00
1 messenger, at $720		720.00
Office of assistant examiner of accounts:		
1 assistant examiner of accounts, at $3,600		3,600.00
1 chief clerk, at $2,000		2,000.00
1 clerk, at $1,600		1,600.00
1 clerk, $1,400		1,400.00
Office of assistant purchasing agent, New York:		
1 assistant purchasing agent, at $3,000	$3,000	
1 chief clerk, at $1,500	1,500	
1 clerk, at $1,380	1,380	
1 clerk, at $1,200	1,200	
1 clerk, at $936	936	
2 clerks, at $900	1,800	
1 inspector, at $960	960	
1 clerk, at $840	840	
1 clerk, at $720	720	
1 clerk, at $480	480	
1 messenger, at $360	360	
1 messenger, at $300	300	
1 warehouseman, at $900	900	
	14,376	
By resolution of the Isthmian Canal Commission, adopted November 9, 1905, the Commission paid one-third of the above salaries		4,792.00
2 clerks, at $1,100 (Commission pays entire salary)		2,200.00
Office of assistant purchasing agent, New Orleans:		
1 assistant purchasing agent, at $2,200		2,200.00
1 clerk, at $1,000		1,000.00
1 messenger, at $480		480.00
Office of assistant purchasing agent, Tacoma:		
1 assistant purchasing agent, at $2,000		2,000.00
1 clerk, at $900		900.00

Office of inspecting engineer at New York:		
1 inspecting engineer, at $3,600	$3,600	
1 assistant inspecting engineer, at $1,920	1,920	
1 clerk, at $1,040	1,040	
1 clerk, at $1,000	1,000	
1 clerk, at $960	960	
1 clerk, at $780	780	
1 clerk, at $480	480	
	9,780	
By resolution of the Isthmian Canal Commission, adopted November 9, 1905, the Commission pays one-third of above salaries		$3,260.00
Total item 1		145,422.00

ITEM 2.

For incidental expenses, including rents, cable and telegraph service, supplies, stationery, and actual necessary traveling expenses in the United States (including rent of the Panama Canal building in the District of Columbia, $7,500, and text-books and books of reference, $1,000)	$53,375.00
For rent of buildings in the United States (including the Panama Canal Building in the District of Columbia, $7,500)	9,700.00
Traveling expenses of officers and employees of the Commission in the United States	5,150.00
Fuel, light, and power	2,500.00
Telegrams, cablegrams, and telephones	18,000.00
Stationery and miscellaneous office supplies, including typewriters and repairs to the same, text-books, and books of reference	8,000.00
Advertising by newspapers and posters	6,950.00
Incidental expenses of administration	3,075.00
Total item 2	53,375.00

ITEM 3.

For pay of members of the Commission and officers and employees on the Isthmus, other than skilled and unskilled labor, including civil engineers, superintendents, instrumentmen, transitmen, levelmen, rodmen, draftsmen, timekeepers, mechanical and electrical engineers, supervisors, clerks, accountants, stenographers, storekeepers, messengers, office boys, foremen and subforemen, watchmen, wagonmasters, stewards, hospital dispensers, internes,

Construction and engineering department—Continued.	
73 clerks, at $1,800	$131,400.00
138 clerks, at $1,500	207,000.00
34 clerks, at $1,200	40,800.00
3 clerks, at $1,000	3,000.00
29 clerks, at $900	26,100.00
3 clerks, at $840	2,520.00
2 clerks, at $720	1,440.00
2 clerks, at $600	1,200.00
2 clerks, at $480	960.00
1 clerk, at $450	450.00
1 inspector, at $3,300	3,300.00
1 inspector, at $2,700	2,700.00
1 inspector, at $2,400	2,400.00
2 inspectors, at $2,100	4,200.00
5 inspectors, at $1,800	9,000.00
1 inspector, at $1,200	1,200.00
3 inspectors, at $900	2,700.00
1 draftsman, at $3,000	3,000.00
1 draftsman, at $2,700	2,700.00
1 draftsman, at $2,400	2,400.00
5 draftsmen, at $2,100	10,500.00
14 draftsmen, at $1,800	25,200.00
18 draftsmen, at $1,500	27,000.00
4 draftsmen, at $1,200	4,800.00
1 draftsman, at $1,000	1,000.00
1 tracer, at $1,200	1,200.00
1 tracer, at $900	900.00
9 instrumentmen, at $2,100	18,900.00
11 transitmen, at $1,800	19,800.00
22 levelmen, at $1,500	33,000.00
15 levelmen, at $1,200	18,000.00
4 rodmen, at $1,200	4,800.00
22 rodmen, at $1,000	22,000.00
5 rodmen, at $900	4,500.00
1 observer, at $1,200	1,200.00
1 photographer, at $2,100	2,100.00
1 photographer's helper, at $480	480.00
1 general secretary, clubhouses, at $2,400	2,400.00
4 secretaries, clubhouses, at $1,800	7,200.00
2 assistant secretaries, clubhouses, at $1,500	3,000.00
3 telegraph operators, at $1,500	4,500.00
12 telephone operators, at $720	8,640.00
3 messengers, at $600	1,800.00
3 messengers, at $480	1,440.00
4 messengers, at $450	1,800.00
2 messengers, at $420	840.00
4 messengers, at $360	1,440.00
3 messengers, at $300	900.00
2 messengers, at $270	540.00
1 messenger, at $240	240.00
1 messenger, at $210	210.00
1 office boy, at $240	240.00
6 division engineers, at $7,500	45,000.00
1 division engineer, at $6,600	6,600.00
2 division engineers, at $5,000	10,000.00
1 division engineer, at $3,500	3,500.00
1 assistant division engineer, at $6,000	6,000.00
1 office engineer, at $4,800	4,800.00
1 assistant engineer, at $4,000	4,000.00
8 assistant engineers, at $3,000	24,000.00
4 assistant engineers, at $2,700	10,800.00
4 assistant engineers, at $2,400	9,600.00
1 designing engineer, at $8,000	8,000.00
1 designing engineer, at $7,500	7,500.00
1 designing engineer, at $6,000	6,000.00
1 designing engineer, at $3,600	3,600.00
1 mechanical engineer, at $5,000	5,000.00

Construction and engineering department—Continued.

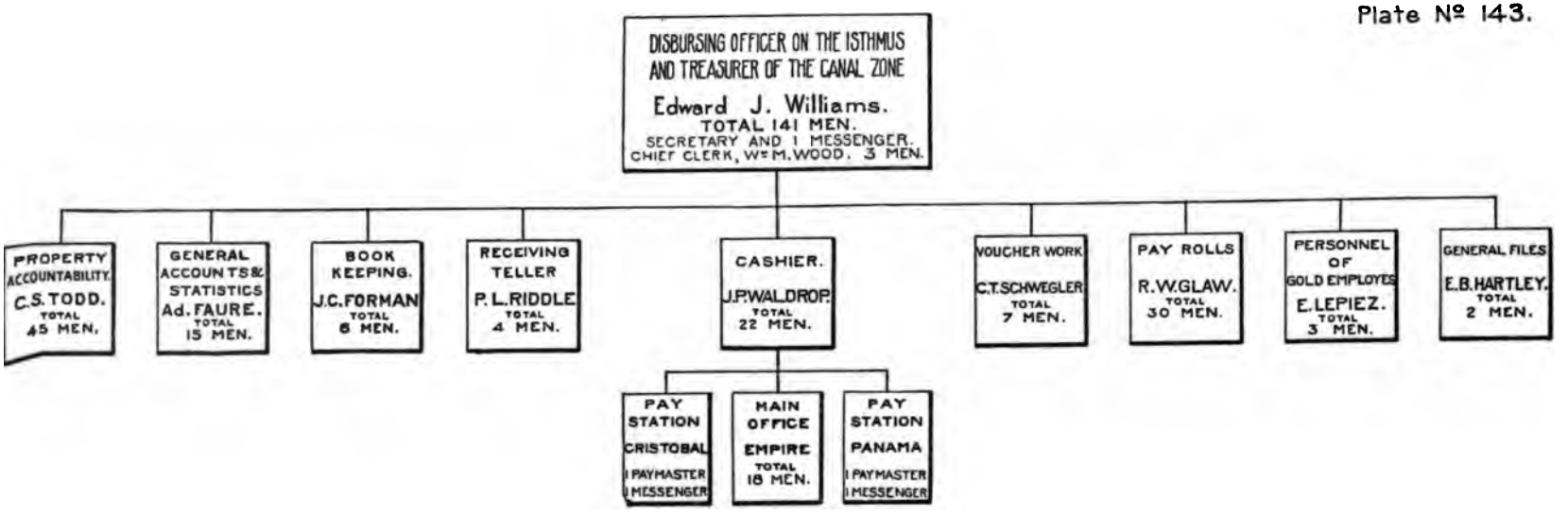
6 resident engineers, at $3,600	$21,600.00
1 resident engineer, at $4,000	4,000.00
1 resident engineer, at $3,300	3,300.00
1 superintendent transportation, at $5,000	5,000.00
1 superintendent transportation, at $2,100	2,100.00
1 assistant superintendent transportation, at $3,000	3,000.00
1 superintendent, at $4,200	4,200.00
1 superintendent, at $4,000	4,000.00
9 superintendents, at $3,600	32,400.00
2 superintendents, at $3,300	6,600.00
7 superintendents, at $3,000	21,000.00
1 superintendent, at $3,000 (10 months)	2,500.00
2 superintendents, at $3,000 (6 months)	3,000.00
8 superintendents, at $2,700	21,600.00
2 superintendents, at $2,400	4,800.00
1 superintendent, at $2,100	2,100.00
6 assistant superintendents, at $3,000	18,000.00
1 supervisor, at $3,600	3,600.00
1 supervisor, at $3,000	3,000.00
1 supervisor, at $2,640	2,640.00
1 supervisor, at $2,400	2,400.00
1 supervisor, at $2,400 (6 months)	1,200.00
7 supervisors, at $2,100	14,700.00
1 supervisor, at $2,100 (10 months)	1,750.00
1 foreman, at $3,000	3,000.00
1 foreman, at $2,400	2,400.00
40 foremen, at $2,100	84,000.00
2 foremen, at $2,040	4,080.00
148 foremen, at $1,800	266,400.00
4 foremen, at $1,800 (10 months)	6,000.00
7 foremen, at $1,800 (6 months)	6,300.00
147 foremen, at $1,500	220,500.00
4 foremen, at $1,500 (10 months)	5,000.00
8 foremen, at $1,500 (6 months)	6,000.00
2 foremen, at $1,680	3,360.00
91 foremen, at $1,200	109,200.00
4 foremen, at $1,200 (10 months)	4,000.00
4 foremen, at $1,200 (6 months)	2,400.00
24 foremen, at $1,000	24,000.00
29 foremen, at $900	26,100.00
7 foremen, at $840	5,880.00
1 foreman, at $750	750.00
16 foremen, at $720	11,520.00
42 foremen, at $600	25,200.00
1 foreman, at $480	480.00

[redacted]

INSPECTOR
R.C. STEVENSON
81 MEN.
ASST.
INSPECTOR
J.C. JOHNSON
80 MEN
AGENT
LAS CASCADAS
PL. BRADLEY.
1 MAN.

Construction and engineering department—Continued.			
Division of meteorology and river hydraulics—Continued.			
Hydrographic stations—			
Alhajuela		$2,910	
Gamboa		600	
Lower Chagres district—			
District hydrographer	$1,800		
Surveyor	1,200		
Gatun (3 stations)	5,410		
Trinidad	1,980		
Gatuncillo	2,080		
Bohio	2,070		
		14,540	
			$18,050.00
Meteorological stations—			
Naos, Ancon, or La Boca—			
1 station (1 year)		2,160	
1 station (3 months)		450	
Bas Obispo (possibly 2 men)		3,000	
Cristobal		2,800	
			8,410.00
Total construction and engineering department			2,939,336.00
Disbursement department:			
1 disbursing officer, at $10,000			10,000.00
1 assistant disbursing officer, at $4,000			4,000.00
1 secretary to disbursing officer, at $2,000			2,000.00
1 bookkeeper (bonded), at $2,125			2,125.00
1 bookkeeper, at $1,800			1,800.00
1 cashier, at $3,600			3,600.00
3 paymasters, at $2,500			7,500.00
2 pay clerks, at $2,200			4,400.00
2 pay clerks, at $2,100			4,200.00
2 pay clerks, at $2,000			4,000.00
2 pay clerks, at $1,850			3,700.00
1 receiving teller, at $1,850			1,850.00
2 check clerks, at $1,800			3,600.00
2 stenographers and typewriters, at $1,800			3,600.00
7 stenographers and typewriters, at $1,500			10,500.00
4 clerks, at $2,400			9,600.00
1 law clerk, at $2,300			2,300.00
1 clerk, at $2,200			2,200.00
6 clerks, at $2,100			12,600.00
6 clerks, at $2,000			12,000.00
24 clerks, at $1,800			43,200.00

Plate Nº 143.


DISBURSING OFFICER ON THE ISTHMUS AND TREASURER OF THE CANAL ZONE
Edward J. Williams.
TOTAL 141 MEN.
SECRETARY AND 1 MESSENGER.
CHIEF CLERK, Wm M. WOOD. 3 MEN.
PROPERTY ACCOUNTABILITY.
C.S. TODD.
TOTAL 45 MEN.
GENERAL ACCOUNTS & STATISTICS
Ad. FAURE.
TOTAL 15 MEN.
BOOK KEEPING.
J.C. FORMAN
TOTAL 6 MEN.
RECEIVING TELLER
P. L. RIDDLE
TOTAL 4 MEN.
CASHIER.
J.P. WALDROP.
TOTAL 22 MEN.
PAY STATION CRISTOBAL
1 PAYMASTER
1 MESSENGER
MAIN OFFICE EMPIRE
TOTAL 18 MEN.
PAY STATION PANAMA
1 PAYMASTER
1 MESSENGER
VOUCHER WORK
C.T. SCHWEGLER
TOTAL 7 MEN.
PAY ROLLS
R.W. GLAW.
TOTAL 30 MEN.
PERSONNEL OF GOLD EMPLOYES
E. LEPIEZ.
TOTAL 3 MEN.
GENERAL FILES
E.B. HARTLEY.
TOTAL 2 MEN.

Construction and engineering department—Continued.

1 blacksmith, at $540	$540.00
2 blacksmiths, at $480	960.00
1 blacksmith's helper, at $450	450.00
1 blacksmith's helper, at $420	420.00
1 blacksmith's helper, at $360	360.00
1 blueprinter, at $600	600.00
1 blueprinter, at $360	360.00
1 bookbinder, at $720	720.00
1 bookbinder, at $384	384.00
7 carpenters, at $1,620	11,340.00
1 carpenter, at $1,500	1,500.00
1 carpenter, at $1,056	1,056.00
1 carpenter, at $912	912.00
3 carpenters, at $768	2,304.00
8 carpenters, at $600	4,800.00
3 carpenters, at $480	1,440.00
1 carpenter, at $384	384.00
6 cart drivers, at $420	2,520.00
2 cart drivers, at $390	780.00
98 cart drivers, at $360	35,280.00
9 coachmen, at $720	6,480.00
2 coachmen, at $600	1,200.00
1 coachman, at $480	480.00
2 compositors, at $720	1,440.00
8 compositors, at $600	4,800.00
184 conductors, at $2,280	419,520.00
2 cooks, at $630	1,260.00
79 cranemen, at $2,220	175,380.00
2 cranemen, at $1,800	3,600.00
3 cranemen, at $1,200	3,600.00
18 deck hands, at $600	10,800.00
25 drill runners, at $1,800	45,000.00
51 drill runners, at $1,500	76,500.00
10 drill runners, at $1,200	12,000.00
10 drill runners, at $900	9,000.00
10 drill runner helpers, at $900	9,000.00
1 electrician, at $2,100	2,100.00
1 engineer chief, at $3,000	3,000.00
1 engineer chief, at $2,520	2,520.00
2 engineers, launch, at $900	1,800.00
14 engineers, ledgerwood, at $1,500	21,000.00
188 engineers, locomotive, at $2,520	473,760.00
14 engineers, pile driver, at $1,500	21,000.00
23 engineers, steam, at $1,800	41,400.00
1 engineer, steam, at $1,620	1,620.00
7 engineers, steam, at $1,500	10,500.00

[redacted]

Construction and engineering department—Continued.	
2 helpers, at $480	$960.00
1 helper, at $420	420.00
1 helper, at $360	360.00
1 helper, at $300	300.00
1 horseshoer, at $600	600.00
1 janitor, at $480	480.00
1 janitor, at $360	360.00
3 levermen, at $2,220	6,660.00
1 lithographer, at $1,500	1,500.00
2 machinists, at $2,100	4,200.00
6 oilers, at $900	5,400.00
4 oilers, at $720	2,880.00
5 oilers, at $660	3,300.00
3 oilers, at $540	1,620.00
1 oilman, at $600	600.00
1 oilman, at $420	420.00
10 packers, at $300	3,000.00
1 painter at $840	840.00
2 painters, at $480	960.00
2 paper cutters, at $384	768.00
1 pipefitter, at $1,500	1,500.00
2 pipefitters, at $1,200	2,400.00
5 pipefitters, at $600	3,000.00
7 pipe-line men, at $1,200	8,400.00
50 pipe-line men, at $450	22,500.00
28 powdermen, at $1,800	50,400.00
17 powdermen, at $1,500	25,500.00
10 powdermen, at $1,200	12,000.00
1 pressman, at $780	780.00
1 pressman, at $750	750.00
2 pressmen, at $720	1,440.00
6 pressmen, at $600	3,600.00
1 pressman, at $528	528.00
1 pressman's assistant, at $600	600.00
2 pressman's assistants, at $456	912.00
5 pumpmen, at $1,620	8,100.00
5 pumpmen, at $1,500	7,500.00
2 pumpmen, at $1,000	2,000.00
4 pumpmen, at $900	3,600.00
3 pumpmen, at $720	2,160.00
5 pumpmen, at $600	3,000.00
2 saddlers, at $600	1,200.00
2 saddlers, at $480	960.00
31 sailors, at $540	16,740.00
12 sailors, at $480	5,760.00
43 sailors, at $450	19,350.00
24 sailors, at $360	8,640.00
1 stableman, at $720	720.00
1 stableman, at $540	540.00
4 stablemen, at $480	1,920.00
5 stablemen, at $420	2,100.00
19 stablemen, at $360	6,840.00
1 stampmaker, at $600	600.00
1 switchman, at $480	480.00
11 teamsters, at $540	5,940.00
137 teamsters, at $480	65,760.00
18 teamsters, at $420	7,560.00
148 trainmen, at $1,200	177,600.00
1 trimmer at $720	720.00
2 waiters, at $240	480.00
3 water-service men, at $1,500	4,500.00
2 winchmen, at $720	1,440.00
2 winchmen, at $660	1,320.00
12 winchmen, at $600	7,200.00
16 winchmen, at $540	8,640.00
Laborers, skilled and unskilled	8,746,167.00
Total construction and engineering department	11,128,947.00

Disbursement department:	
2 janitors, at $480	$900.00
Labor, quarters, and subsistence department:	
Unskilled labor	300,000.00
Total item 4	11,429,847.00

ITEM 5.

For purchase and delivery of material, supplies, and equipment, including cost of inspecting material and of paying traveling expenses incident thereto, whether on the Isthmus or elsewhere, and such other expenses not in the United States as the Commission deems necessary to best promote the construction of the Isthmian Canal, for the departments of construction and engineering, disbursing, examination of accounts, and labor, quarters, and subsistence	$11,752,708.00
New equipment:	
La Boca dredging division—	
Machinery and appliances	5,000.00
Chagres division—	
Dredge and outfit	150,000.00
Launch	5,000.00
Gatun locks—	
Power plant	432,010.00
Pumping plant	30,000.00
Forms	90,000.00
16-inch sand-suction dredge	35,000.00
Seagoing tug	75,000.00
Buildings, wharves, tracks, etc., Porto Bello	40,000.00
Gatun dam—	
Hydraulic sluicing plant	35,000.00
Discharge pipe, pontoons, and hose connection	29,500.00
La Boca locks—	
Concrete work and approach walls at north end of lock	663,588.00
Power plant	110,000.00
La Boca dam—	
Rock fills for toes of dam	90,055.00
Trestles at toes of dam	60,045.00
Steam tug	75,000.00
Concrete mixers and conveyors	20,000.00
Buildings—	
Marine barracks	10,500.00
General offices	17,500.00
30 4-family houses, at $6,067.05	182,011.50
16 24-room dormitories, at $9,720.15	155,522.40

New equipment—Continued.	
Materials, tools, and supplies—Continued.	
Fuel	$1,301,950.00
Explosives	1,981,800.00
Rails and fastenings	273,095.00
Frogs and switches	26,249.00
Ties	122,500.00
Piling	275,000.00
Bridge timber	48,000.00
Cement	439,090.00
Pipe and fittings	83,000.00
Bricks, lumber, paints, oils, and miscellaneous supplies	499,318.00
Marine department—	
For floating equipment (other than fuel)	76,900.00
Subsistence	29,800.00
Shops	21,000.00
Forage (750 animals)	99,899.50
Blacksmith	2,396.00
Harness and shop material	12,853.50
Stable utensils	753.00
Veterinary medicines and instruments	1,000.00
Repairs:	
Floating equipment	122,500.00
Buildings—	
General office buildings	15,000.00
Quarters	235,000.00
Shops	7,000.00
Hotels	25,000.00
Division office buildings	20,000.00
Miscellaneous buildings	18,500.00
Corrals	1,500.00
Compressor plants	5,000.00
Electric-light plants	2,000.00
Storehouses	50,000.00
Miscellaneous	170,700.00
Traveling expenses of inspectors, officers, and special agents, including salaries and services	44,000.00
Total item 5	11,752,708.00

ITEM 6.

To continue the equipment and construction of the Panama Railroad, to be disbursed directly under the Isthmian Canal Commission, $1,750,000; no part of said sum shall be expended until the obligation of the Panama Railroad Company for the full amount thereof and drawing 4 per cent interest payable to the United States shall have been delivered to the Secretary of the Treasury of the United States and by him accepted $1,750,000.00

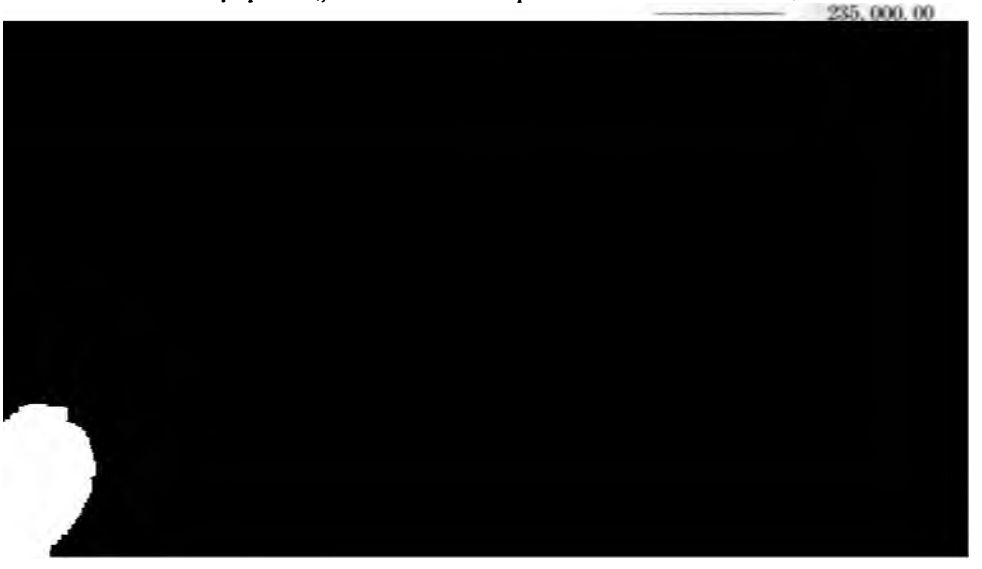
	Material.	Labor.	Total.
Grading	$75,000.00	$645,000.00	$720,000.00
Temporary trestles	150,000.00	100,000.00	250,000.00
Tunnel	20,000.00	10,000.00	30,000.00
Temporary tracks	100,000.00	50,000.00	150,000.00
Permanent tracks	150,000.00	50,000.00	200,000.00
Ballast	10,000.00	40,000.00	50,000.00
Fencing	6,000.00	4,000.00	10,000.00
Telegraph and telephones	25,000.00	20,000.00	45,000.00
Depots	6,000.00	4,000.00	10,000.00
Water stations	6,000.00	4,000.00	10,000.00
Fuel stations	12,000.00	8,000.00	20,000.00
Miscellaneous structures	5,000.00	5,000.00	10,000.00
General expenses	10,000.00	50,000.00	60,000.00
Plant	100,000.00	10,000.00	110,000.00
Engineering		75,000.00	75,000.00
Total item 6	675,000.00	1,075,000.00	1,750,000.00

SUPPLEMENTAL ESTIMATE.

For equipment of Panama Railroad	$1,213,940.00
8 refrigerator cars	40,000.00
4 first-class coaches	33,440.00
4 second-class coaches	26,400.00
5 baggage and mail cars (2 specie)	27,500.00
200 80,000-pound box cars	200,000.00
6 caboose cars	6,600.00
2 coal lighters	20,000.00
Dock (permanent), capacity 3 600-foot ships	700,000.00
Coal-handling plant	60,000.00
New quarters for employees	100,000.00
Total supplemental item No. 6	1,213,940.00

ITEM 7.

For miscellaneous expenditures, cable and telegraph service, stationery and printing, and traveling and incidental expenses on the Isthmus for the departments of construction and engineering, disbursing, examination of accounts, and labor, quarters and subsistence		$456,430.00
Construction and engineering department:		
Local transportation	$156,000.00	
Extra train service	5,000.00	
Telegraph and cables	5,000.00	
Travel on the Isthmus	15,330.00	
Stationery and printing	7,100.00	
Incidental expenditures	8,000.00	
		196,430.00
Disbursement department:		
Transportation of currency to the Isthmus	15,000.00	
Miscellaneous expenditures, including special pay trains	10,000.00	
		25,000.00
Labor, quarters, and subsistence department:		
Transportation and recruiting—		
1,000 West Indians, at $15	60,000.00	
3,075 Europeans, at $40	123,000.00	
800 gold men, at $20	16,000.00	
Local transportation	2,000.00	
Repatriation	24,000.00	
Stationery, printing, and incidental expenditures	10,000.00	
		235,000.00



Division of public works—Continued.	
Chief clerk, at $1,800	$1,800.00
Clerk, at $1,500	1,500.00
Clerk, at $900	900.00
Messenger, at $450	450.00
Messenger, at $300	300.00
Supervisor, at $2,400	2,400.00
2 cashiers and accountants, at $1,800	3,600.00
2 plumbing inspectors, at $1,980	3,960.00
2 general foremen, at $1,800	3,600.00
Engineer, at $2,100	2,100.00
Clerk and interpreter, at $1,200	1,200.00
Watchman, at $1,200	1,200.00
Fire department:	
Chief, at $2,500	2,500.00
Assistant chief, at $1,800	1,800.00
6 captains, at $1,800	10,800.00
6 lieutenants, at $1,620	9,720.00
Chief clerk, at $2,100	2,100.00
Clerk, at $1,500	1,500.00
Messenger, at $360	360.00
Prosecuting attorney's office:	
Prosecuting attorney, at $3,600	3,600.00
Assistant prosecuting attorney, at $2,400	2,400.00
Clerk, at $1,800	1,800.00
Judiciary:	
Chief justice supreme court and circuit court, at $6,500	6,500.00
2 associate justices supreme court and circuit judges, at $6,000	12,000.00
1 supreme court clerk, at $3,000	3,000.00
3 circuit court clerks, at $2,100	6,300.00
3 circuit court interpreters, at $1,800	5,400.00
3 circuit court messengers, at $360	1,080.00
2 circuit court janitors, at $360	720.00
1 district court judge, at $2,750	2,750.00
4 district court judges, at $2,400	9,600.00
Clerical assistance for district judges	1,200.00
Police department:	
Chief, at $4,000	4,000.00
First lieutenant, at $2,000	2,000.00
Second lieutenant, at $1,800	1,800.00
Chief clerk, at $2,100	2,100.00
2 clerks, at $1,800	3,600.00
4 clerks, at $1,500	6,000.00
16 sergeants, at $1,500	24,000.00
20 corporals, at $1,320	26,400.00
100 first-class policemen, at $1,200	120,000.00
75 second-class policemen, at $480	36,000.00
Department of revenues:	
Collector of revenues, at $5,000	5,000.00
1 deputy collector of revenues, at $2,400	2,400.00
1 deputy collector of revenues, at $2,100	2,100.00
2 clerks, at $2,100	4,200.00
6 clerks, at $1,800	10,800.00
10 clerks, at $1,500	15,000.00
1 storekeeper, at $1,800	1,800.00
1 inspector of customs, at $1,800	1,800.00
2 inspectors of customs, at $1,500	3,000.00
2 land agents, at $1,500	3,000.00
2 bookkeepers, at $1,200	2,400.00
3 copyists, at $900	2,700.00
3 messengers, at $360	1,080.00
Collection of taxes—	
4 district collectors, at $2,100	8,400.00
4 inspectors, at $1,500	6,000.00
4 clerks, at $1,200	4,800.00
4 copyists, at $900	3,600.00

Department of revenues—Continued.	
Postal division—	
1 postmaster, at $2,600	$2,600.00
2 postmasters, at $2,400	4,800.00
2 postmasters, at $2,100	4,200.00
3 postmasters, at $1,800	5,400.00
6 postmasters, at $1,650	9,900.00
4 postmasters, at $1,500	6,000.00
5 assistant postmasters, at $1,600	8,000.00
23 postal clerks, at $1,500	34,500.00
10 postal clerks, at $1,200	12,000.00
1 copyist, at $900	900.00
5 railway messengers, at $1,000	5,000.00
1 post-office messenger, at $720	720.00
14 post-office messengers, at $450	6,300.00
3 post-office messengers, at $360	1,080.00
Total	179,480.00
Less estimated revenues from postal service	75,000.00
	104,480.00
Total item 8	496,460.00

ITEM 9.

For skilled and unskilled labor in the service of the government of the Canal Zone	$73,360.00
Division of public works:	
4 engineers, at $1,200	4,800.00
6 firemen, at $600	3,600.00
Unskilled labor, at $12,000	12,000.00
Fire department:	
Engineer, at $1,800	1,800.00
Electrician, at $1,800	1,800.00
30 firemen, at $1,500	45,000.00
Extra pay to volunteers, estimated at 4,000 hours, $1	4,000.00
Police department:	
Janitor, at $360	360.00
Total item 9	73,360.00

ITEM 10.

[redacted]

Prosecuting attorney's office:		
Books and office supplies	$500	
Traveling, miscellaneous, and contingent expenses	500	
		$1,000.00
Judiciary:		
Books, printing, and office supplies	1,000	
Traveling, miscellaneous, and contingent expenses	1,000	
		2,000.00
Police department:		
Stationery, printing, and office supplies	3,500	
Horses, arms, and accouterments	8,000	
Forage	5,000	
Maintenance of prisoners	9,000	
Traveling, miscellaneous, and contingent expenses	10,000	
		35,500.00
Postal division:		
Stationery, printing, and office supplies	13,000	
Transportation of mails	25,000	
Traveling, miscellaneous, and contingent expenses	2,500	
		40,500.00
Total item 10		118,500.00

ITEM 11.

For pay of officers and employees, other than skilled and unskilled labor, engaged in the sanitation department on the Isthmus	$764,786.00
Office of chief sanitary officer:	
1 chief sanitary officer (Commissioner) $10,000	10,000.00
1 executive officer, at $5,200	5,200.00
1 general inspector, at $3,300	3,300.00
1 chief clerk, at $2,400	2,400.00
3 clerks, class D, at $2,100	6,300.00
7 clerks, class C, at $1,800	12,600.00
18 clerks, class B, at $1,500	27,000.00
1 vaccinator, at $1,500	1,500.00
1 watchman, at $600	600.00
2 messengers, at $600	1,200.00
2 messengers, at $360	720.00
Property division:	
1 storekeeper, at $2,100	2,100.00
1 storekeeper, at $1,800	1,800.00
3 clerks, at $1,500	4,500.00
3 watchmen, at $600	1,800.00
Quarantine service:	
1 chief quarantine officer, at $7,000	7,000.00
2 quarantine officers, at $3,500	7,000.00
1 assistant quarantine officer, Colon, at $2,400	2,400.00
1 clerk and stenographer, at $1,800	1,800.00
1 custodian (also serving as disinfector), at $1,500	1,500.00
1 quartermaster and disinfector, at $1,500	1,500.00
1 clerk and custodian, Colon, at $1,500	1,500.00
1 quartermaster, Panama, at $1,200	1,200.00
2 matrons, at $300	600.00
4 watchmen, at $300	1,200.00
Ancon Hospital:	
1 superintendent, at $7,000	7,000.00
1 executive officer, at $3,300	3,300.00
1 chief surgical clinic, at $4,500	4,500.00
1 chief medical clinic, at $4,500	4,500.00
1 oculist and aurist, at $4,500	4,500.00
2 physicians, at $3,000	6,000.00
3 physicians, at $2,400	7,200.00
8 physicians, at $1,800	14,400.00
1 alienist, at $3,000	3,000.00
1 chief clerk, at $2,100	2,100.00
1 clerk, at $1,800	1,800.00
2 clerks, at $1,500	3,000.00

Ancon Hospital—Continued.	
1 clerk, at $1,800	$1,800.00
1 druggist, at $1,800	1,800.00
1 assistant druggist, at $1,500	1,500.00
1 superintendent of nurses, at $1,800	1,800.00
1 assistant superintendent of nurses, at $1,500	1,500.00
1 operating-room nurse, at $1,200	1,200.00
1 dietist, at $1,200	1,200.00
35 nurses, at $900	31,500.00
35 nurses, at $720	25,200.00
1 matron, insane, at $900	900.00
1 chaplain, at $1,200	1,200.00
1 visiting chaplain, at $480	480.00
1 commissary, at $1,800	1,800.00
1 quartermaster, at $1,500	1,500.00
1 storekeeper, at $1,800	1,800.00
1 superintendent of laundry, $2,100	2,100.00
1 assistant superintendent of laundry, $1,500	1,500.00
1 embalmer, at $1,500	1,500.00
4 nurses, male, at $720	2,880.00
4 nurses, male, at $900	3,600.00
Laboratory:	
1 chief of laboratory, at $4,000	4,000.00
1 pathologist, at $3,000	3,000.00
1 chemist, at $3,000	3,000.00
1 bacteriologist, at $3,000	3,000.00
2 laboratory attendants, at $1,020	2,040.00
1 attendant, at $540	540.00
11 attendants, at $360	3,960.00
21 attendants, at $300	6,300.00
1 assistant druggist, at $900	900.00
2 telephone operators, at $300	600.00
3 subforemen, at $450	1,350.00
1 gardener, at $360	360.00
1 gardener, at $300	300.00
1 messenger, at $180	180.00
2 messengers, at $126	252.00
1 foreman, at $600	600.00
Office of director of hospitals:	
1 director of hospitals, at $8,000	8,000.00
1 chief clerk, Class A, at $2,100	2,100.00
1 clerk, class C, at $1,800	1,800.00
1 clerk, class B, at $1,500	1,500.00
1 visiting chaplain, at $480	480.00
1 conductor of hospital cars, at $900	900.00
1 quartermaster of launch (captain)	1,200.00

Colon Hospital—Continued.	
2 chaplains, at $1,200	$2,400.00
10 attendants, at $360	3,600.00
30 attendants, at $300	9,000.00
4 messengers, at $216	864.00
2 watchmen, at $360	720.00
1 foreman, at $900	900.00
1 subforeman, at $600	600.00
Taboga Sanitarium:	
1 superintendant (physician), at $3,000	3,000.00
1 chief nurse, at $1,200	1,200.00
1 nurse, at $900	900.00
1 nurse, at $720	720.00
1 storekeeper and clerk, at $1,500	1,500.00
1 mechanical foreman, at $1,500	1,500.00
4 attendants, at $300	1,200.00
1 watchman, at $360	360.00
1 attendant, at $360	360.00
Palo Seco Leper Asylum:	
1 superintendent, at $1,800	1,800.00
1 nurse, at $1,200	1,200.00
4 attendants, at $480	1,920.00
La Boca Dispensary:	
1 physician, at $2,400	2,400.00
1 clerk and dispenser, at $900	900.00
1 dispenser of quinine, at $720	720.00
1 dispenser in sick camp, at $360	360.00
1 attendant, at $360	360.00
Tivoli district and Panama Dispensary:	
1 physician, at $2,400	2,400.00
1 clerk and dispenser, at $900	900.00
1 dispenser of quinine, at $720	720.00
1 attendant, at $360	360.00
Corozal Dispensary:	
1 physician, at $2,400	2,400.00
1 clerk and dispenser, at $900	900.00
1 dispenser of quinine, at $600	600.00
1 attendant, at $360	360.00
Pedro Miguel Dispensary:	
1 physician, at $2,400	2,400.00
1 clerk and dispenser, at $900	900.00
1 dispenser of quinine, at $600	600.00
1 dispenser in sick camp, at $360	360.00
1 attendant, at $300	300.00
Paraiso Hospital:	
1 physician, at $3,000	3,000.00
1 physician, at $1,800	1,800.00
1 clerk, at $1,500	1,500.00
1 nurse, at $900	900.00
1 dispenser of quinine, at $720	720.00
1 dispenser, white sick camp, at $600	600.00
1 dispenser for colored sick camp, at $360	360.00
2 attendants, at $360	720.00
1 attendant (Cucuracha), sick camp, at $360	360.00
Culebra Hospital:	
1 physician, at $3,600	3,600.00
1 physician, at $3,000	3,000.00
1 physician, at $2,400	2,400.00
2 physicians, at $1,800	3,600.00
1 ophthalmic and aural surgeon, at $1,800	1,800.00
1 clerk, at $1,800	1,800.00
1 druggist, at $1,200	1,200.00
1 chief nurse, at $1,200	1,200.00
2 nurses, at $900	1,800.00
2 dispensers of quinine, at $720	1,440.00
1 chaplain, at $1,200	1,200.00
2 attendants, at $360	720.00
2 attendants, at $300	600.00

Empire Hospital:	
1 physician, at $3,000	$3,000.00
1 physician, at $2,400	2,400.00
1 physician, at $1,800	1,800.00
1 clerk, at $1,500	1,500.00
1 druggist, at $720	720.00
1 nurse, at $900	900.00
1 dispenser of quinine, at $720	720.00
1 dispenser, sick camp, white, at $600	600.00
1 attendant, at $300	300.00
2 attendants, at $180	360.00
Las Cascadas Hospital:	
1 physician, at $3,000	3,000.00
1 physician, at $1,800	1,800.00
1 clerk, at $1,500	1,500.00
1 druggist, at $600	600.00
1 dispenser of quinine, at $600	600.00
1 nurse, at $900	900.00
1 attendant, at $360	360.00
2 attendants, at $300	600.00
Bas Obispo Hospital:	
1 physician, at $3,000	3,000.00
1 physician, at $2,400	2,400.00
1 physician, at $1,800	1,800.00
1 clerk, at $1,500	1,500.00
1 druggist, at $600	600.00
1 nurse, Santa Cruz Camp, at $900	900.00
1 nurse, at $720	720.00
1 dispenser of quinine, at $600	600.00
1 attendant, at $360	360.00
3 attendants, at $300	900.00
Gorgona Hospital:	
1 physician, at $3,000	3,000.00
1 physician, at $2,400	2,400.00
1 physician, at $1,800	1,800.00
1 clerk, at $1,500	1,500.00
1 druggist, at $720	720.00
2 nurses (Mamei), at $900	1,800.00
1 nurse (Bas Matachin shops), at $900	900.00
1 dispenser of quinine, at $600	600.00
1 chaplain, at $1,200	1,200.00
1 attendant (Mamei), at $480	480.00
2 attendants, at $360	720.00
1 attendant, at $300	300.00
Tabernilla Dispensary:	

Cristobal Dispensary—Continued.	
1 druggist, at $600	$600.00
1 dispenser at sick camp, at $360	360.00
Railroad construction camps:	
1 physician, at $1,800	1,800.00
1 nurse, at $900	900.00
1 dispenser, sick camps, at $360	360.00
1 attendant, at $360	360.00
Porto Bello quarry camp:	
1 physician, at $1,800	1,800.00
1 nurse, at $900	900.00
2 attendants, at $360	720.00
Miraflores Dispensary	
1 physician, at $1,800	1,800.00
1 clerk and dispenser, at $900	900.00
1 dispenser of quinine, at $720	720.00
1 attendant, at $300	300.00
San Pablo Dispensary:	
1 physician, at $1,800	1,800.00
1 clerk and dispenser, at $900	900.00
1 dispenser of quinine, at $720	720.00
1 attendant, at $300	300.00
Santo Tomas Hospital:	
1 superintendent, at $3,600	3,600.00
2 internes, at $1,800	3,600.00
1 chief nurse, at $1,200	1,200.00
2 nurses, at $900	1,800.00
Extra positions and allowances for leaves of absence and sickness over and above the scheduled numbers of personnel asked for by the hospital division:	
2 physicians, at $2,400	4,800.00
7 physicians, at $1,800	12,600.00
1 clerk, at $1,500	1,500.00
2 clerks and dispensers, at $900	1,800.00
1 druggist, at $1,200	1,200.00
3 dispensers of quinine, at $720	2,160.00
5 male nurses, at $720	3,600.00
1 chaplain, at $480	480.00
1 chaplain, at $1,200	1,200.00
Office of chief sanitary inspector:	
1 chief sanitary inspector, at $3,600	3,600.00
1 assistant chief sanitary inspector, at $2,400	2,400.00
3 district inspectors, at $2,100	6,300.00
5 district inspectors, at $1,800	9,000.00
7 sanitary inspectors, at $1,500	10,500.00
6 sanitary foremen, at $1,200	7,200.00
15 sanitary police, at $900	13,500.00
1 chief clerk, Class A, at $2,100	2,100.00
2 chief clerks, Class C, at $1,800	3,600.00
2 clerks, Class B, at $1,500	3,000.00
2 clerks, at $900	1,800.00
2 foremen, at $900	1,800.00
10 foremen, at $720	7,200.00
5 foremen, at $600	3,000.00
10 storekeepers, at $600	6,000.00
15 subforemen, at $450	6,750.00
Health office of Panama:	
Health officer at $3,600	3,600.00
1 assistant health officer, at $2,400	2,400.00
2 clerks, Class C, at $1,800	3,600.00
1 assistant timekeeper $1,200	1,200.00
1 record clerk, at $1,200	1,200.00
1 storekeeper, Class A, at $1,500	1,500.00
1 assistant storekeeper, at $900	900.00
2 sanitary inspectors, at $1,800	3,600.00
6 sanitary inspectors, at $1,500	9,000.00

Health office of Panama—Continued.	
1 sanitary inspector, at $1,200	$1,200.00
1 foreman carpenter, at $1,620	1,620.00
2 foremen, at $900	1,800.00
6 foremen, at $900	5,400.00
6 foremen, at $600	3,600.00
8 subforemen, at $450	3,600.00
Health office of Colon-Cristobal:	
1 health officer, at $3,600	3,600.00
1 health office physician, at $2,400	2,400.00
1 chief clerk, Class A, at $2,100	2,100.00
2 clerks, Class B, at $1,500	3,000.00
2 sanitary inspectors, at $1,800	3,600.00
2 sanitary inspectors, at $1,500	3,000.00
1 sanitary foreman, at $1,200	1,200.00
1 foreman carpenter, at $1,620	1,620.00
2 medical inspectors, at $1,500	3,000.00
7 foremen, at $600	4,200.00
7 subforemen, at $450	3,150.00
Total item 11	764,786.00

ITEM 12.

For skilled and unskilled labor engaged in the sanitation department on the Isthmus of Panama	$667,003.80
Office of chief sanitary officer:	
1 janitor, at $600	600.00
3 assistant janitors, at $300	900.00
Emergency sanitary work	32,280.00
Property division:	
1 carpenter, at $600	600.00
8 laborers, at $300	2,400.00
Quarantine service:	
1 engineer, at $1,620	1,620.00
1 assistant engineer, at $600	600.00
1 launchman, at $720	720.00
1 cook, Panama, at $600	600.00
1 cook, Colon, at $480	480.00
1 fireman and machinist, at $480	480.00
8 sailors, at $360	2,880.00
1 assistant cook, at $420	420.00
2 cook's helpers, at $360	720.00
6 waiters, at $240	1,440.00

[redacted]

Laboratory—Continued.	
12 laundresses, at $270	$3,240.00
5 laundresses, at $240	1,200.00
4 laundresses, at $210	840.00
30 laundresses, at $180	5,400.00
1 baker, at $720	720.00
1 baker, at $540	540.00
1 baker, at $360	360.00
11 waiters, at $240	2,640.00
1 waiter, at $360	360.00
14 scullions, at $240	3,360.00
1 fireman, at $480	480.00
1 janitor of morgue, at $480	480.00
2 cooks, at $1,080	2,160.00
1 cook, at $600	600.00
2 cooks, at $540	1,080.00
1 cook, at $450	450.00
1 cook, at $360	360.00
1 dairyman, at $540	540.00
2 dairymen, at $300	600.00
1 fireman (laundry), 20 cents hour, $499	499.00
1 carpenter, 32 cents hour, $798	798.00
2 painters, 25 cents hour, $624	1,248.00
50 laborers, average 10 cents hour, $240	12,000.00
Office of director of hospitals:	
1 engineer, at $900	900.00
1 fireman, at $420	420.00
2 sailors, at $360	720.00
Colon Hospital:	
1 chief cook, at $1,200	1,200.00
1 head waiter, at $450	450.00
4 assistant cooks, at $720	2,880.00
6 assistant cooks, at $300	1,800.00
16 scullions, at $180	2,880.00
15 waiters, at $240	3,600.00
30 ward maids, at $144	4,320.00
40 orderlies, at $180	7,200.00
1 ambulance driver, at $540	540.00
3 stablemen, at $300	900.00
3 gatemen, at $300	900.00
6 scrubbers, at $240	1,440.00
4 seamstresses, at $240	960.00
2 carpenters, at $624	1,248.00
2 painters, at $624	1,248.00
2 firemen, at $300	600.00
10 laborers, at $324.48	3,244.80
10 laborers, at $224.60	2,246.00
Taboga Sanitarium:	
1 cook, at $600	600.00
1 cook, at $300	300.00
6 orderlies, at $180	1,080.00
1 laundress, at $180	180.00
4 skilled laborers, at $768	3,072.00
Paraiso Hospital:	
2 orderlies, at $240	480.00
1 cook, at $360	360.00
1 laundress, at $180	180.00
Culebra Hospital:	
3 orderlies, at $240	720.00
7 orderlies, at $180	1,260.00
1 ambulance driver, at $480	480.00
1 cook, at $600	600.00
1 assistant cook, at $360	360.00
Empire Hospital:	
1 orderly, at $240	240.00
2 orderlies, at $180	360.00
1 cook, at $360	360.00

Las Cascadas Hospital:	
2 orderlies, at $180	$360.00
1 cook, at $360	360.00
1 laundress, at $180	180.00
2 orderlies, at $240	480.00
Bas Obispo Hospital:	
3 orderlies, at $180	540.00
1 cook (hospital), at $240	420.00
1 cook (white sick camp), at $360	360.00
1 cook (colored sick camp), at $300	300.00
1 laundress, at $180	180.00
1 orderly, at $240	240.00
Gorgona Hospital:	
2 cooks, at $360	720.00
1 orderly, at $240	240.00
2 orderlies, at $180	360.00
1 laundress, at $180	180.00
1 laundress (Manuel), at $72	72.00
Gatun Hospital:	
1 cook, at $420	420.00
2 orderlies, at $240	480.00
2 orderlies, at $180	360.00
Railroad construction camps:	
1 orderly, at $180	180.00
Porto Bello quarry camp:	
2 orderlies, at $240	480.00
Office of chief sanitary inspector:	
79 night sollmen, at $384	28,800.00
6 masons and tilers, at $624	2,496.00
15 masons and tilers, at $499.20	7,488.00
10 masons and tilers, at $798.72	7,987.20
10 carpenters, at $624	6,240.00
30 carpenters, at $492.20	14,976.00
30 carpenters, at $339.36	11,980.80
250 laborers, at $624	156,000.00
50 laborers, at $449.20	24,960.00
400 laborers, at $312	140,400.00
25 water boys, at $216.40	5,460.00
Health office of Panama:	
[illegible] third grade, at $600	600.00
carpenter, third grade, at $600	600.00
carpenter, second grade, at $480	480.00
2 carpenters, first grade, at $384	768.00
3 laborers, at $351	1,053.00
120 laborers, at $270	32,400.00
[illegible]	[illegible]

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Quarantine service:	
Subsistence of personnel, including laborers and persons detained in quarantine at Panama and Colon	$5,817.00
Fuel	801.00
Household furniture	1,828.00
Office furniture	180.00
Stationery and office supplies	540.00
Disinfecting suppplies	3,479.00
Supplies for boats, including equipment	850.00
Miscellaneous supplies	1,675.00
Laundry	600.00
Miscellaneous	9,820.00
Ancon Hospital:	
Storehouse supplies	30,000.00
Commissary supplies	90,000.00
Transportation	1,000.00
Electric current	10,752.00
Drugs and dressings	23,000.00
Hospital division:	
Subsistence of personnel and patients	150,000.00
Equipment of new hospitals, and renewing equipment of old hospitals	29,499.50
Drugs and dressings	58,282.26
Miscellaneous, coal, lumber, lights, transportation, etc	41,693.44
Office of chief sanitary inspector:	
Stationery and office supplies	1,000.00
Disinfectants	18,000.00
Lumber	5,555.60
Oils, mosquito-kerosene	20,000.00
Transportation, railroad, garbage, removal, etc	10,000.00
Miscellaneous, supplies, tools, etc	16,000.00
Health office of Panama:	
Stationery and office supplies	1,000.00
Disinfectants	2,200.00
Lumber	600.00
Oils, mosquito-kerosene	3,500.00
Cart hire	9,390.00
Miscellaneous, supplies, tools, rope, etc	6,000.00
Health office of Colon-Cristobal:	
Stationery and office supplies	500.00
Disinfectants	5,000.00
Lumber	1,000.00
Oils, mosquito-kerosene	1,500.00
Miscellaneous, tools, etc	3,538.00
Total item 13	743,400.80

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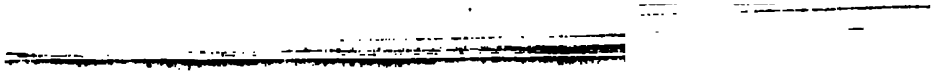

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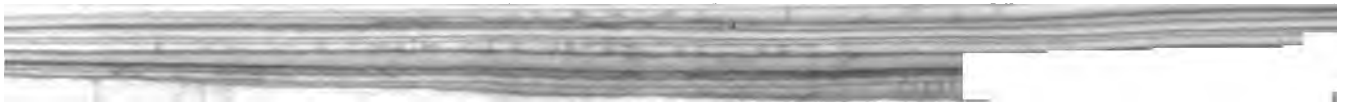

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